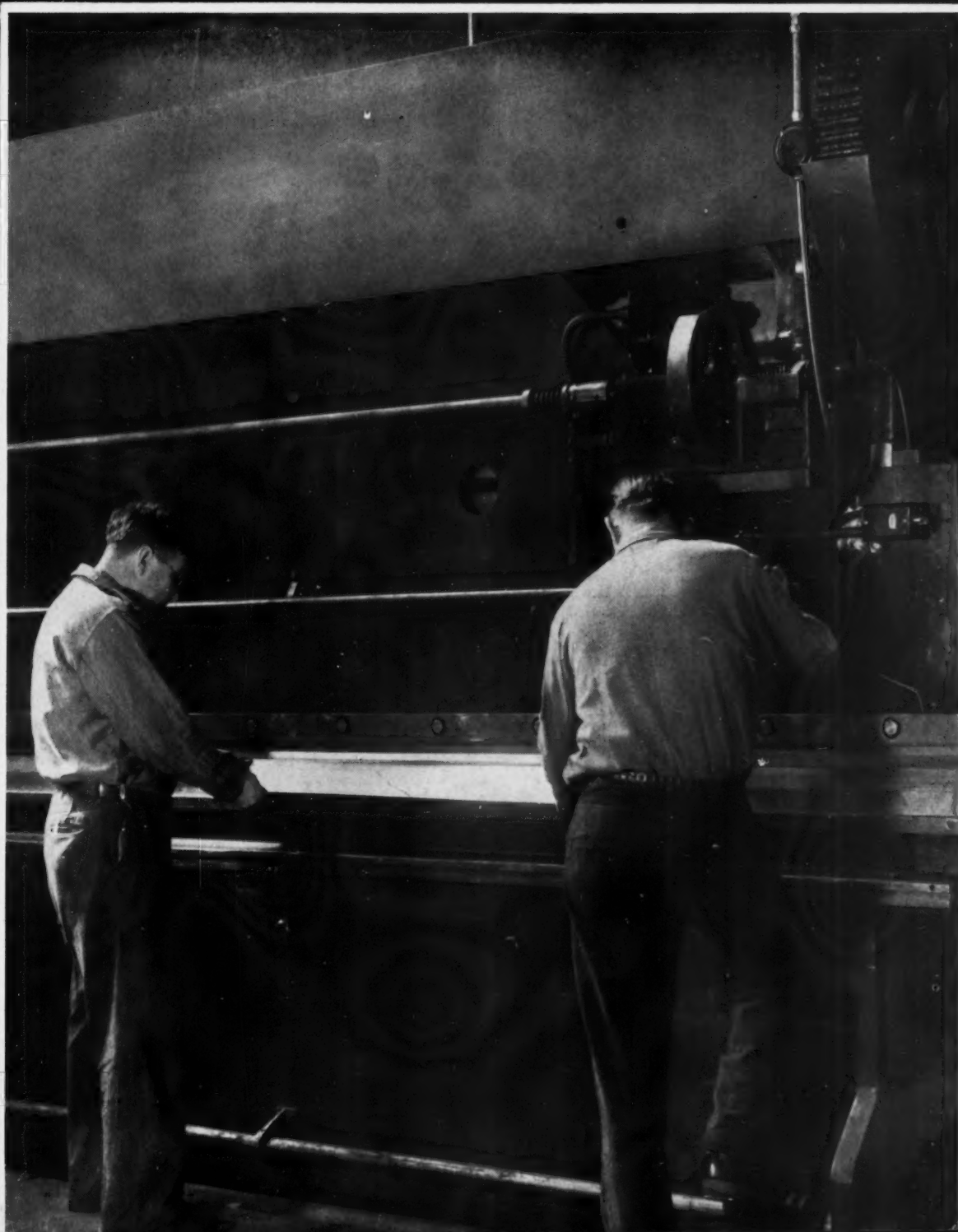


AMERICAN ARTISAN

WARM AIR HEATING • AIR CONDITIONING
SHEET METAL CONTRACTING

AIR
CONDITIONING
SECTION

PAGE 49



ESTABLISHED
8 8 0

FEBRUARY

9 3 9

LAMNECK LEADS THE INDUSTRY WITH THE NEW SERIES 700 SYSTEM

The Most Advanced Line of
★ **PREFABRICATED DUCT AND FITTINGS** ★
Developed to Date

GREATER ECONOMY, SIMPLICITY AND FLEXIBILITY

● LAMNECK again takes the lead in the industry with its development of Series 700 System which prominent warm air heating engineers pronounce the most advanced line of Prefabricated Duct and Fittings that has been produced to date.

Carefully engineered to meet present day high standards of greater efficiency, flexibility and economy, and thoroughly tested in accordance with the most advanced installation practice in Forced Air and Air Conditioning, Lamneck now offers the new Series 700 System as the complete answer to your duct and fittings problem.

The new Series 700 System is not only better engineered, more efficient, easier and more economical to install than any previous Lamneck System, but it is also decidedly more complete and adaptable to all types of installations. Yet it has fewer parts by far, which means that it requires smaller stocks to carry and less investment to take care of a far wider and more diversified range of installations.

NEW TYPE CONNECTION

An outstanding feature of Series 700 System is the new type Connection of Duct and Stack which greatly simplifies and speeds up assembly. Made with a positive automatic lock it

eliminates notching of duct, stack or fittings. It provides a tight, rigid joint, free from leakage, and a smooth inside to the duct which offers minimum resistance to the flow of air in either direction.

GREATLY REDUCED INSTALLATION COST

Series 700 System is so simplified and flexible that cost of material and labor of assembly and installation are reduced to a point almost unbelievable. Less cutting, a new method of assembly and an ingenious method of changing dimensions eliminate waste and reduce effort to a minimum.

NEW LAMNECK SERVICE FEATURES

To get a more detailed story of Series 700 System, write for the following new service features, now ready for distribution: LAMNECK SERIES 700 Catalog, a more complete and helpful book than ever before . . . INSTALLATION MANUAL, a simple and easily understood guide which saves time and labor in installation . . . ENGINEERING GUIDE, a new feature offered for the first time, which gives invaluable technical data to simplify the work of designing an air distribution system for residence heating and air conditioning.

Write for these interesting books today. Furnished without charge.

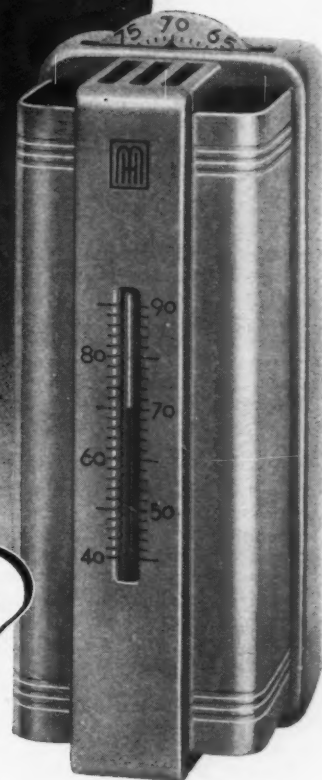


LAMNECK PRODUCTS, INC.

414 DUBLIN AVENUE

● COLUMBUS, OHIO

PREFABRICATED DUCT AND FITTINGS FOR ALL TYPES OF RESIDENTIAL
WARM AIR HEATING AND AIR CONDITIONING SYSTEMS



THE *Symbol* OF THE NEW
AUTOMATIC HEATING

Irons out . . .

HEATING PEAKS and VALLEYS

The Accelerator does it!

The best conventional thermostat in the world can't prevent fluctuations in the modern automatic heating system—"Peaks and Valleys" that bring alternate over-heating and under-heating in any home. The answer is that automatic firing demands a quick-acting, positive control that has the ability actually to sense temperature changes before they occur and to meet them by speeding up or slowing down burner operation. The M-H Acratherm with its exclusive

Accelerator feature, is the only modern thermostat capable of this almost uncanny heating "foresight." Give your customers the new efficiency and comfort the Acratherm brings, by installing it and its companion, M-H Limit Controls with every burner installation. Dependable Controls cost less than service. Depend upon controls bearing the M-H Symbol. Minneapolis-Honeywell Regulator Company, 2726 Fourth Avenue South, Minneapolis, Minnesota.

MINNEAPOLIS-HONEYWELL

BROWN INDUSTRIAL INSTRUMENTS
NATIONAL PNEUMATIC CONTROLS

Control Systems

In This Issue

THIS month's cover picture shows mechanics forming stainless steel in a power brake with the edges of the dies protected with adhesive tape. Photo by Republic Steel Corp.

★ We often hear of a furnace dealer who sells 100 or more furnaces a year, but such a dealer operating from a town of 227 population is something out of the ordinary. On page 32 we report the activities of H. W. Liesener, Jackson, Wis., who sells more than 100 furnaces a year to a trade largely rural or small village and by careful planning keeps a dozen mechanics working steadily the year round.

★ As more and more contractors fabricate stainless steel for more and more types of items the problem of protecting the highly polished surfaces from marring in the machine or on the bench becomes important. On page 36 we report some protective measures (and show photographs) which are inexpensive, but positive.

★ Two state conventions are reported in this issue. Illinois, where state and local ordinances and automatic firing discussions kept contractors busy and Indiana where the association cooperated with Purdue University to stage a technical program of the "see and understand" variety. See pages 42 and 73.

★ Every contractor is interested in ideas which bring into the shop work which has gone to other crafts in the last few years. For example, water proofing of spandrel beams, where all kinds of materials have been tried and found wanting. On page 46, we explain a new idea—the use of newly developed sheet copper specialties which make this kind of water proofing a part of the sheet metal contract.

★ On page 56 we publish part 2 of the series of charts showing weights of metal and labor time required to fabricate common duct sections. We are interested in any comparisons from contractors who maintain detailed records of the same type.

★ After much argument and conversation, this industry has slowly accepted the theorem that systems with many openings must be controlled by several thermostats—in other words zoned, but on page 62 we describe and show a 63-opening installation balanced on one thermostat to the owner's satisfaction.

AMERICAN ARTISAN

With which is merged

**FURNACES
AND
SHEET METALS**

AND

**Warm-Air
Heating**

Covering All Activities in

Gravity Warm Air Heating

Forced Warm Air Heating

Sheet Metal Contracting

Ventilating

Air Conditioning

J. D. Wilder, Editor

A. A. Kennedy, Assistant Editor

Vol. 108, No. 2

February, 1939

Founded 1880

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RESIDENTIAL AIR CONDITIONING SECTION

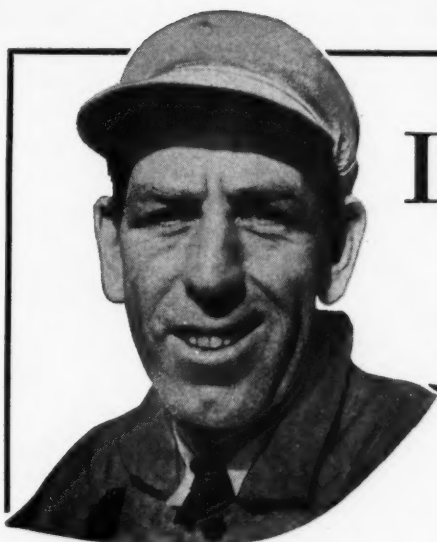
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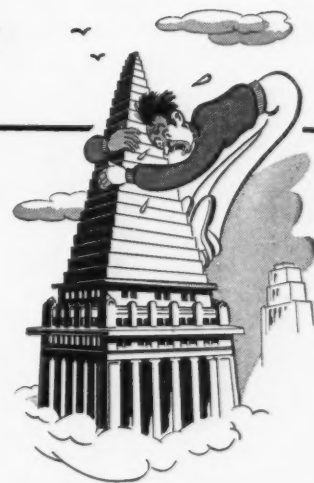
Yearly Subscription Price—U. S. and possessions, Canada, Mexico, South America, Central America, \$2.00; Foreign, \$4.00. Single copies, U. S. and possessions, \$0.25. Back numbers, \$0.50. January, 1939, Directory issue, \$1.00 per copy. Entered as second-class matter, July 29, 1932, at the post office at Chicago, Illinois, under the act of March 3, 1879.

More than 8,000 Copies of this Issue are being distributed



I'm No Steeple Jack!

by Tim Shears



EARLY one morning I'm wandering around the shop looking for a couple of peen hammers that the boys are always snaffling on me, when in pops the boss. "Tim," he says, "I just heard a way to make a lot of money." I thought he was going to give me the low-down on making silver dollars out of Monel. But he goes on, "Take this roofing business. There's money in it...if you know how to handle it. Maybe you can pick up a tip or two and pass 'em along to our contractor friends."

In two shakes of a soldering iron I'm riding the subway. Riding it off and on all day, in fact. The Monel roofing jobs I saw must have brought a mint of dough to somebody. And saved a pile for the owners. Rain, snow, salt air and corrosive fumes meant nothin' to these Monel roofs. At the Penn station they tell me the Monel roof is close to 30 years old...and good for 300 more.

Anyway, I found the Cloisters Museum, Natural History Museum, New York Historical Society, Metropolitan Museum of Art and all such places had Monel roofs. So I stop off at Wall Street not far from our main office, and drop in at the Bankers Trust Building.

I pick up the super and up we go in the elevator. Seems like we fly past fifty floors, or maybe a hundred, before we stop. Then we step out on the roof and the super shows me the swell job some contractor did with Monel. "Step careful," he says, "and we'll shin up to the top. The view is swell." "How nice," I grins, "but I forgot my mountain climbing togs. And besides, I'm no steeple Jack either!"

* * *

Still an' all, I picked up a pointer or two on Monel roofing that maybe you can use:

SIZE OF SHEETS: Most contractors use Monel roofing sheets 96" long by 24", 30" or 36" wide. Gauges 24 (.025") and 25 (.021")... about the same as 20 oz. and 16 oz. copper.

CLEATS: Monel cleats 1½" wide are O.K., but the 2" ones are

better. Use Monel nails, and bend back one end of the cleat to cover the nail and protect the roofing sheet.

BENDS AND SEAMS: Use a radius at least twice thickness of sheet.

SOLDERING: Same as for copper. Pre-tin edges with soft solder, using killed acid flux with small amount of ammonium chloride.

ALLOWANCE BETWEEN SHEETS: Monel is too stiff to buckle with heat, so allow 3/16" in a ten-foot span.

CONSTRUCTION: Use any of the three types shown below.

ANYTHING ELSE YOU WANT TO KNOW: Just drop me a line.

Yours for better roofs (and nearer the ground),

TIM SHEARS.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street
New York, N. Y.



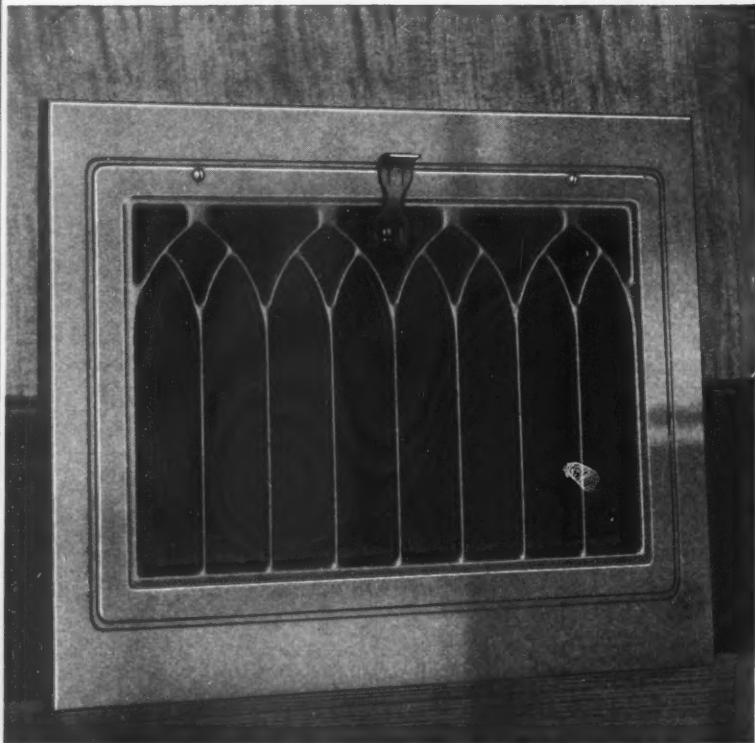
For weather flashings a little Monel goes a long way. Be sure to use it on your next job.

The BIG 3 IN THE GRAVITY FIELD

are Products of

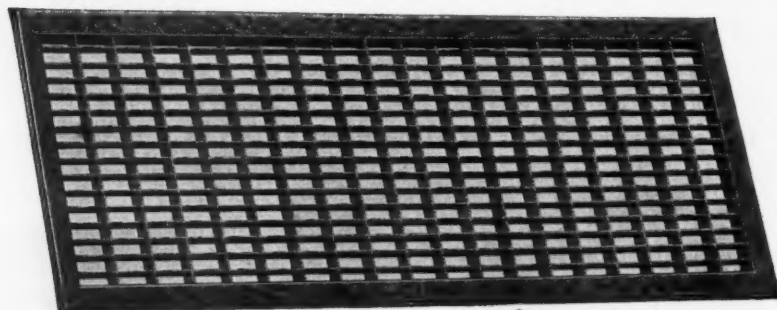


—a thoroughly sound endorsement by the majority of installers of the superiority of H & C Registers. If you, like most alert installers, believe that it pays to handle the best in registers, but are not using H & C items, by all means inspect them at your H & C Jobber and compare them with what you are now using. You'll find that they are superior in design, in construction, in finished workmanship—the things that can be counted upon to help make sales. Yet they cost not one bit more than ordinary registers. No. 37 Catalog showing the complete gravity line will be sent on request.



1

The classic design of the H & C No. 120 Baseboard Register and its dignified air of refinement, are greatly appreciated by home owners. Neat, tight and secure installations, assured by lapping the stackhead over the register frame, make for complete and lasting satisfaction.

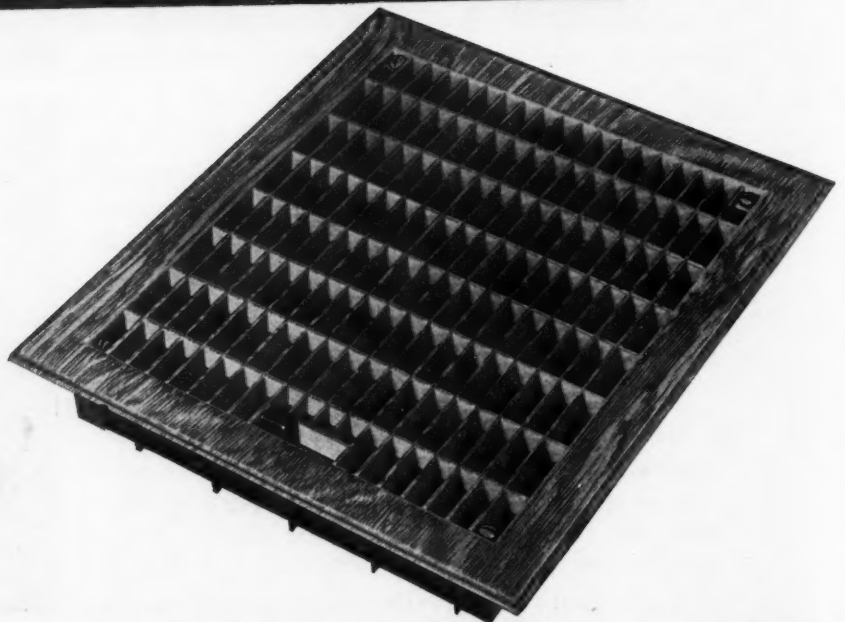


2

The H & C No. 265 "NO-FLEX" Return Air Face matches the No. 210 Floor Register. Cross members are welded to each other and to the frame for maximum strength. Upper edges of members are squared for improved appearance. Corner joints are invisible. Margins are narrow for close installation.

3

At right is the H & C No. 210 "NO-FLEX" Floor Register—the most popular floor register ever built. Openings are 7/16"x1-7/16". Exceptionally sturdy, rigid, and heel-proof.



HART & COOLEY MANUFACTURING CO.

Warm Air Registers  Air Conditioning Grilles
Damper Regulator Sets Dampers, Chain, Pulleys

61 W. KINZIE STREET, CHICAGO, ILLINOIS
ENGINEERING OFFICE AND FACTORY • HOLLAND • MICH.

"Sharp Tuning"*

comes to the
**Automatic
Temperature Control
Industry**

*Trade-mark for White-Rodgers Device
Registered, 1938, White-Rodgers Electric Co.



"Sharp Tuning"

In a radio, accuracy which insures perfect undistorted reception. In a control, accuracy which insures perfect automatic regulation of temperature or pressure.

WHITE-RODGERS "Hydraulic-Action" Control Achieves New Standards of Precision



What is "Sharp Tuning"? It's a phrase borrowed from radio... to describe the amazingly accurate performance of the new WHITE-RODGERS "HYDRAULIC-ACTION" CONTROL.

For just as "Sharp Tuning" gave the modern radio an exactness of station selectivity... far superior to the inaccurate, multiple dialing of early day sets... so does this new WHITE-RODGERS "Sharp Tuning" CONTROL give automatically controlled products on which it is installed, an exactness of control far more accurate than anything previously known.

But "Sharp Tuning" in accuracy is only one of the many big advantages of the WHITE-RODGERS "HYDRAULIC-ACTION" CONTROL. This remarkable new unit provides a POSITIVE SNAP-ACTION AND CONTACT... never before possible... which make it immune to any normal vibration or "off-level" installation. It's unusually easy to install, too. Requires no service attention. And costs no more than other, far less accurate controls.

Specify and Install WHITE-RODGERS Controls on Your Equipment

See that your Heating, Piping and Air Conditioning equipment has the most modern, efficient and dependable controls available... by specifying and installing WHITE-RODGERS "HYDRAULIC-ACTION" CONTROLS. They not only provide "Sharp Tuning"... but are sturdily constructed and give trouble-free service for years. Get full information... by mailing Coupon today!

WHITE-RODGERS ELECTRIC CO.

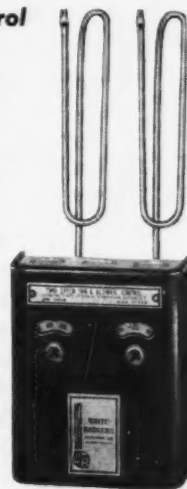
1209 CASS AVENUE • ST. LOUIS, MO.

"Hydraulic-Action" controls are also available through Julien P. Friez & Sons, Baltimore, Md., Division of Bendix Aviation Corporation, for 63 years the Makers of America's Weather Instruments.

There's a WHITE-RODGERS "Hydraulic-Action" Control for Every Service Need

Two-Speed Blower Control

This control provides fully automatic control of blower operation, high—low—off. Visible scale. Adjustable differential 10 to 80 degrees. Can be used with any standard two-speed motor. White-Rodgers "Hydraulic-Action" is also available in warm air limit controls, surface and immersion hot water controls, steam pressure controls, stoker timers, gas valves, etc.



TYPE 523

MAIL COUPON FOR DETAILS

WHITE-RODGERS ELECTRIC COMPANY
1209 Cass Ave., St. Louis, Mo.

Gentlemen: I am interested in White-Rodgers "Sharp Tuning" for (type of product) _____

Firm _____

Individual _____

Street No. _____

City _____ State _____

AA 239

AT LAST

A PERMANENT CLEANABLE EFFICIENT AIR FILTER AT LOW COST

AIR-MAZE



AIR FILTER PANELS

...FOR...

**Winter Warm Air Conditioners,
Furnace Blower Units and
Replacements on Existing Jobs**

Engineered to meet present day standards of dependable performance the new AIR-MAZE KLEENFLO air filter panels are also *priced* to make them the most economical to buy and use.

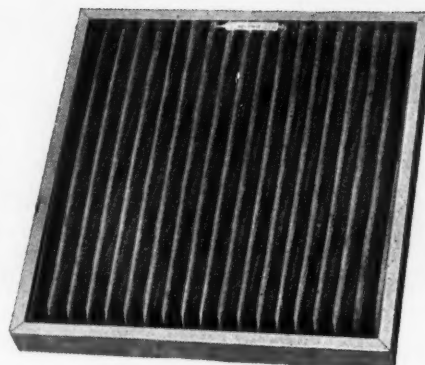
These new permanent filters have a tested efficiency of 98% to 99.6% with relatively low pressure drop. Yet their initial cost is only slightly higher than that of conventional throwaway filters. This means *real economy* when you consider that with reasonable care KLEENFLO panels will last as long as the air conditioning system.

LOW COST OF UPKEEP

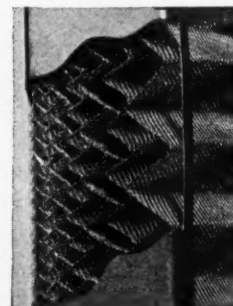
KLEENFLO panels may readily be completely cleaned time and again during their long life. After each simple servicing—costing only a few cents—they again have the performance and characteristics of new filters. Measure this minimum expense of upkeep against frequent replacements of throwaway filters, each costing a dollar or more! The saving is obvious.

HOLD MORE DUST

The unique screen wire element with its scientific designed V-shaped and exactly spaced baffles provides a vast dust holding capacity which is $1\frac{1}{2}$ to 2 times greater than that of conventional filters. This means increased efficiency, less servicing and greater economy.



Standard
20"x20" type K2
AIR-MAZE
KLEENFLO
filter panel.



Cutaway view of filter element. Observe precise construction embodying scientific AIR-MAZE design.

EASY TO CLEAN—NO CLOGGING

KLEENFLO panels are easily and thoroughly cleaned merely by swishing in a pan of hot water or under a stream of hot water. Then they may be recharged by spraying with any inexpensive oil of SAE 20 viscosity. An ordinary insect spray gun will answer the purpose. Or if desired, the panel may be immersed in oil and then drained thoroughly. Because of the scientific "open" construction of the KLEENFLO element and the extra large area provided, no clogging can occur.

TROUBLE-FREE PERFORMANCE

Free flow of air; long operating service between cleaning intervals; all-metal construction which gives rigidity and makes the KLEENFLO panel fire resistant and odorless; accurate fit which permits KLEENFLO panels to slip readily into spaces previously occupied by standard size conventional filters; long life—All these features insure top-notch and trouble-free performance from KLEENFLO panels.

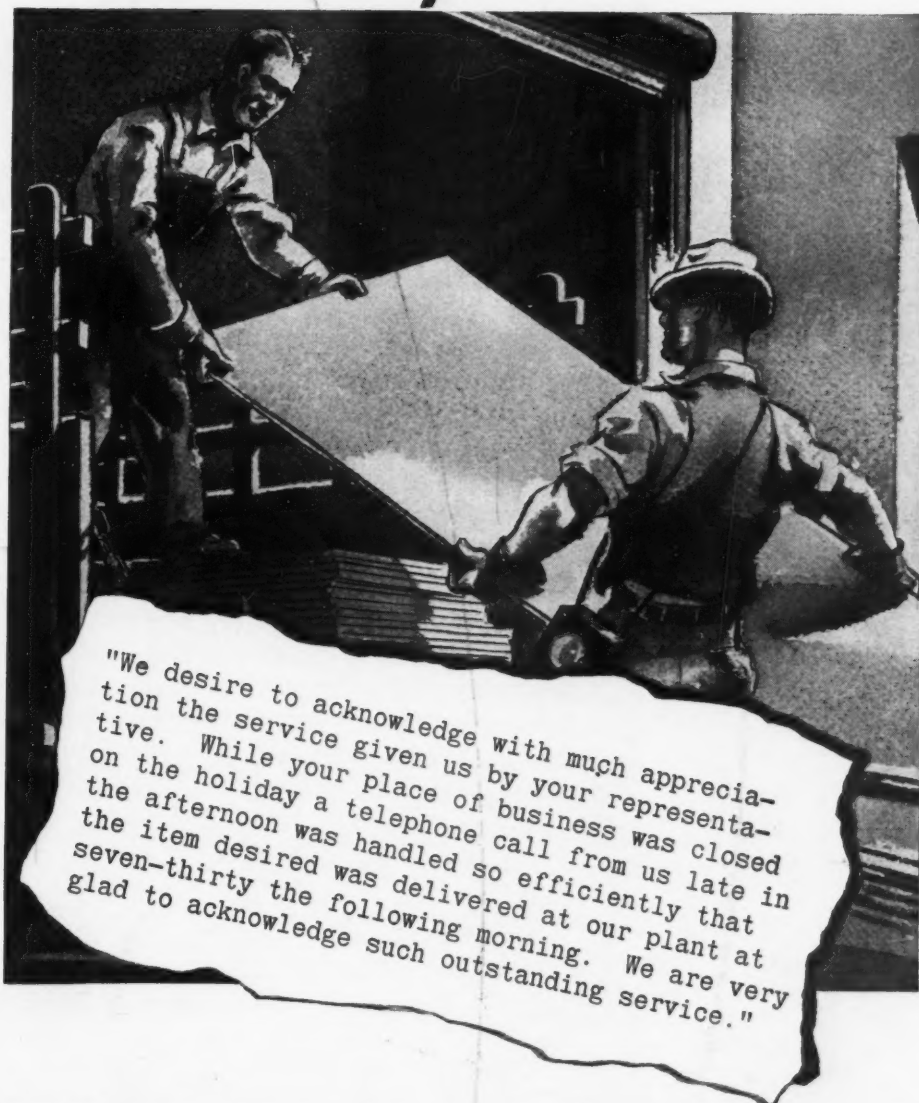
Write today for Bulletin KCP-118 and prices.

AIR-MAZE CORPORATION - 5130 Harvard Ave., Cleveland, Ohio

AIR-MAZE

Thanks for the Kind Words...but
that was regular *"Scully Service"*

ALLOYS
ANGLES, HOT ROLLED and COLD ROLLED
ARCHES (CORRUGATED)
BARBIT
BARS and HOOPS
BARS, HOT ROLLED
ALLOYS HR and CF)
COLD FINISHED
ELECTRIC HIGH CARBON STEEL
REINFORCING
BEAMS and C. B. SECTIONS
BEEF RAIL
BOLTS, NUTS, WASHERS, ALL KINDS
BORING and TURNING BARS and GRINDERS
BRACES, BOILER
CHAIN, ALL KINDS
CHANNELS
CHISELS
CHUCKS, STAYBOLT
CLAMPS, BOILERMAKERS
CLIPS, PATTERSON
CLEANERS, FLUE
CONDUCTOR PIPE
COPPER and BRASS
COUPLINGS, HOSE
CRAYONS, SOAPSTONE
CUTTERS
DARDELET RIVET and MACHINE BOLTS
DRILL RODS
EAVE TROUGH and FITTINGS
EXPANDERS, FLUE
FERRULES, COPPER
FLANGES, BOILER and TANK
FLOOR PLATES
GALVANIZED SHEETS, BARS, BANDS, ETC.
HANDLES, HAMMER
HEADS, TANK and FLANGE
HOISTS, HAND and POWER
IRON, STAYBOLT
LUGS, BOILER, TANK and SILO
MACHINERY, HAND and POWER
MANHEAD PLATES and FITTINGS
NAILS
PACKING
PAINT STICKS
PLATE STEEL, STANDARD QUALITIES
ABRASION RESISTING
COR-TEN and MAN-TEN
PLUGS, FLUE
RAILS and FITTINGS
REAMERS
SHAFTING
SHEETS
ABRASION RESISTING
COR-TEN and MAN-TEN
HOT ROLLED and UNIFORM BLUE
WELLSVILLE POLISHED
COLD ROLLED
STAINLESS STEEL
GALVANIZED and GALVANNEALD
LONG TERNE
CORRUGATED
U-S-S COPPER STEEL
SPRING STEEL BARS and SHEETS
STAINLESS STEEL
STRIP STEEL, CR and HR
TEES
TIRE, ROUND EDGE
TOOLS, HAND and POWER
for BOILER and IRON WORK
TROLLEYS
TUBES, BOILER
TURNBUCKLES
VALVES, BLOW-OFF
WELDING ROD and WELDERS
ZEES



THIS letter from a customer in our Boston Warehouse territory is typical of many we receive. And we like to get them. But as a matter of fact there was nothing really unusual about this example of Scully Service. Prompt, friendly service is the rule on every order.

Thousands of users know that when they want steel it pays to call Scully. All eight warehouses carry a huge stock

of steel, steel products, copper and brass. Each warehouse operates on the principle that customers want their materials prepared and shipped at once. And when you say, "Rush," we know you mean it.

Phone, write or wire the Scully warehouse nearest you. And ask for our handy, complete Stock List and Reference Book. It's free, of course.

SCULLY STEEL PRODUCTS COMPANY

Distributors of Steel, Steel Products, Copper and Brass

CHICAGO • NEWARK, N. J. • ST. LOUIS • BOSTON • ST. PAUL • MINNEAPOLIS
CLEVELAND • PITTSBURGH • BALTIMORE

UNITED STATES STEEL

COLD 70 TAKES THE COUNT

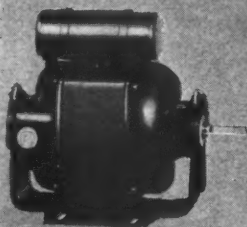
Equip your forced air heating systems with the Leland 2-speed blower motor and cold 70° becomes a thing of the past. In fact, 2-speed operation is so much more efficient that heating engineers agree that here is the next big development in the winter air conditioning field.

Get into this field... with the aid of the Leland 2-speed motor. This top quality stoker drive is specially designed for this application. And in addition, it possesses all those qualities of quietness, stamina, and extra dependability that have made other Leland motors the preference of scores of appliance builders.

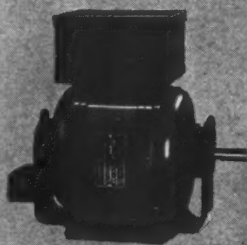
The 2-speed Leland motor can be obtained in either split-phase (illustrated below) or condenser start types... ready for use on 3 or 5 wire controls. Optional equipment includes thermomatic protection against burn-outs due to overloading. 110 or 220 volts. 60 cycle. 1725/1140 RPM.

Obtain a Leland 2-speed motor for comparison and test. Don't delay, for now is the time to enter this rapidly growing field. The Leland Electric Co., Dayton, Ohio.

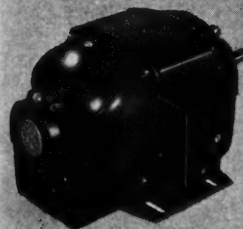
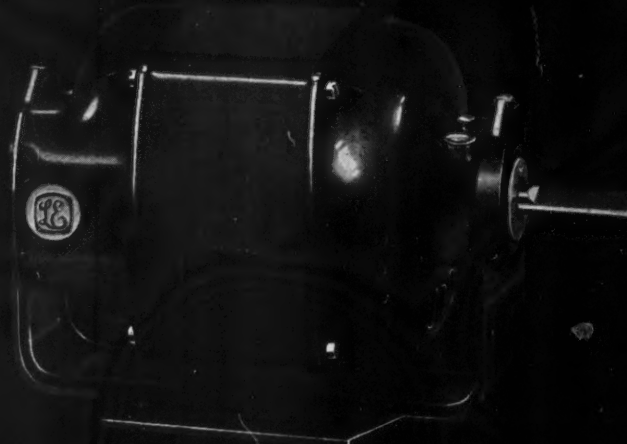
More Than 200 Fully Equipped Service Stations



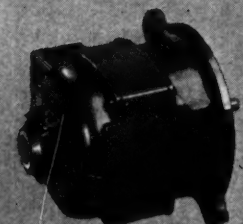
Leland capacitor-start, cradle base motor for blowers and stokers.



Leland capacitor start and run high efficiency blower motor.



Leland repulsion-induction cradle mounted motor for stokers.



Leland rigid flange split-phase oil burner motor.

LELAND MOTORS

TWO SPEED

Non-Freeze

Uniform Temperatures

using

AEROFIN HEAT EXCHANGE SURFACE

NOW you may place heating coils in the cold air stream and obtain uniform temperature over the entire face of the coils even when steam is throttled for partial loads during freezing weather. The unique dual-tube design of this newest Aerofin development distributes steam so that stratification is prevented over the face of the coils at any percentage of heating capacity.

The new Aerofin Non-Freeze Heat Exchange Surface introduces steam from an inner tube, through orifices into the outer tube. The supply and return are located at the same end of the unit. In this way, the condensed steam flows back around the heated inner tube, preventing the condensate from freezing. This allows any degree of steam throttling without danger of freezing.

As an economy result, the necessity for using a separate tempering coil is eliminated, reducing the number of valves, traps and piping; and control is greatly simplified.

AEROFIN Non-Freeze Coils are available now in one row units, giving a temperature rise from 0 degrees to 81 degrees at 5 pound steam pressure and 500 feet face velocity. For ventilation, where 0 degree to 81 degrees or less are required, only one coil in depth is necessary, thus eliminating the use of a tempering and reheating coil. Aerofin Non-Freeze Coils can be used with Aerofin Flexitube where

higher temperature rises are desired. Casings are of galvanized iron flanged for direct duct connections in Aerofin standard sizes. Overall casing dimensions are the same as Aerofin Flexitube, except for depth in direction of air flow. The depth of the coil casing is 5 inches instead of the standard 10 inch depth for Aerofin units.

All piping strains are transmitted to the casings without imposing any strains on the core. Each tube is free to expand or contract independent of adjacent tubes. Cores are pitched in the casings, allowing units to be installed in any position without pitching the heater casings.

These provisions for assurance of continuous heating without danger of freezing are available only in Aerofin Non-Freeze Coils.

Request your copy of
the Descriptive Bulletin
describing this newest
Aerofin development.



AEROFIN CORPORATION
410 So. Geddes St.
Syracuse, N. Y.

Please send at once your new illustrated
bulletin describing Aerofin Non-Freeze Coils.

Name.....

Firm.....

Address.....

PLIERS

THAT SET NEW PERFORMANCE STANDARDS

● If you measure tool *performance* in terms of utility, convenience, safety, operating efficiency and length of serviceable life, then you appreciate the significance of our headline statement.

Crestoloy Pliers *have* set new standards in these exact terms! Actually, there are no other pliers like Crestoloys. The steel is different. Utmost precision and closest control parallel every step in manufacture. Then comes the series of gruelling tests which every individual Crestoloy Plier must pass. Crestoloys *have* to be superior to get by our own inspectors and into the stock room.

The Crescent line includes pliers of almost every type. Fifteen patterns are now available under the "Crestoloy" brand and many more, including the combination or slip-joint types, are available under the "Crescent" trademark. All are fully guaranteed.



Genuine Crestoloy Pliers can be identified by this blue and silver tag attached to every tool.



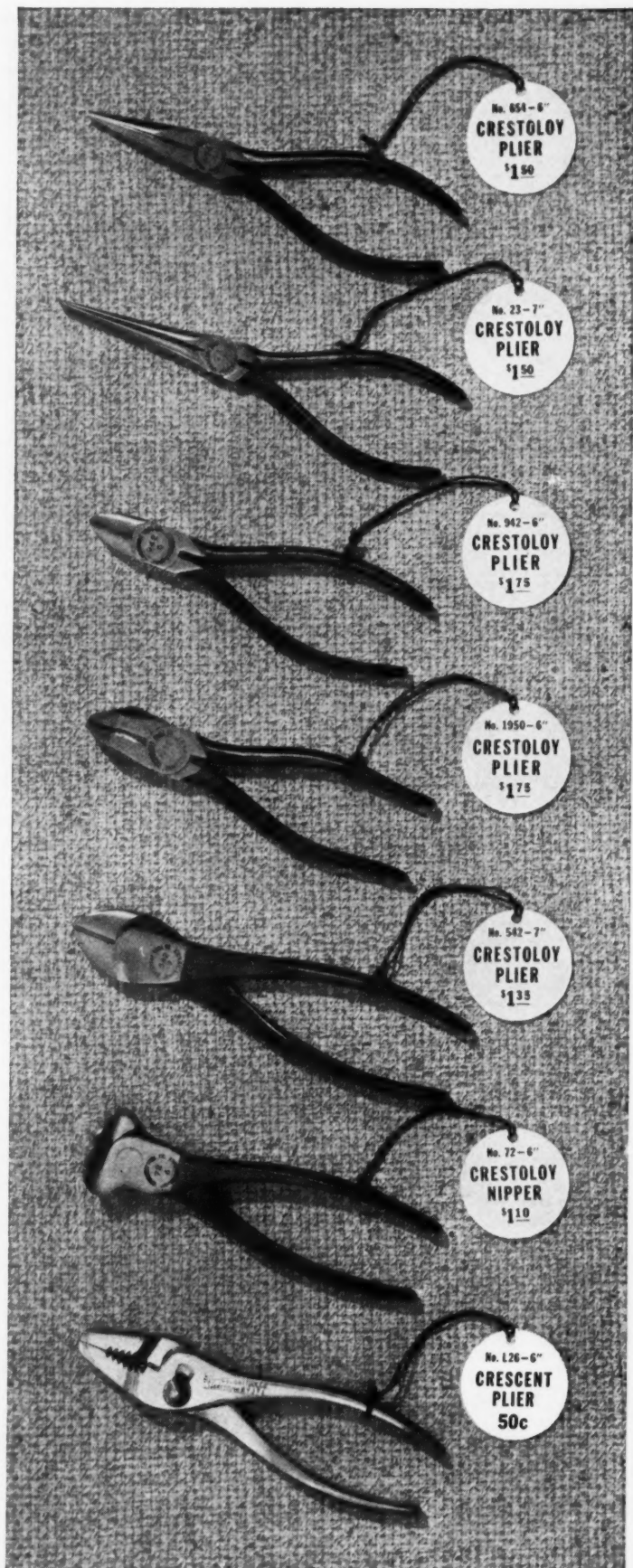
EVERY CRESTOLOY PLIER IS INDIVIDUALLY TESTED

After cutting a piece of hardened plow steel wire in this Testing Machine, every Crestoloy Cutting

Plier must then cut cleanly through a strip of .003" bond paper so that the end drops free.

CRESCENT TOOL COMPANY
JAMESTOWN, N. Y.

30-135



CRESCENT and Smith & Hemenway **TOOLS**



*Marching along
together*

STEEL.. STYLE.... COMFORT



Sheets - Plates - Pipe and Tubular
Products - Conduit - Tin Plate - Bars
Rods - Wire - Nails - Unions - Tie
Plates and Spikes

25-11B

YOUNGSTOWN

Except for steel, the shoes we wear would be little better than medieval sandals, with their shapeless ugliness and destruction of foot health.

The arch which assures comfort, safety, lasting appearance, is made by a steel brace concealed in the leather. Heels are possible because of steel nails. Steel eyelets keep the laces from tearing the leather. The laces thread easily because of steel tips--to say nothing of the steel machinery vital to processing the leather and making the shoe themselves.

It takes almost 100 pieces of steel to make most pair of modern shoes, and they are only a small fraction of the thousands and thousands of pieces of steel you use every day to make life comfortable and safe. Steel makes possible your electric light, home heating plant, canned food delicacies, automobile, office building and factory, railroad--in fact steel makes possible the standard of living on which civilization depends.

For almost every one of this multitude of uses a special steel is required, and Youngstown maintains a great laboratory and special staffs of research and field experts to find exactly the right steel for every modern use.

**THE YOUNGSTOWN SHEET
AND TUBE COMPANY**

Manufacturers of Carbon and Alloy Steels

General Offices
YOUNGSTOWN, OHIO

TICKLISH JOB?



Here's a tip . . .

Bethlehem Sheets

"Take a spiral elbow. There's one of the toughest layouts a sheet metal man is liable to strike. You've got to hand-machine it, and you've got some pretty fancy grooving and peening to do. The job needs A-1 sheets.

Bethlehem sheets are my tip for this tricky layout. The galvanizing sticks tight, even when you practically fold them double in the brake. And the steel itself is dead soft. Hammering in a radius or edging a curve is a cinch with these Bethlehem sheets. We use them for every kind of job in our shop."

BETHLEHEM STEEL COMPANY





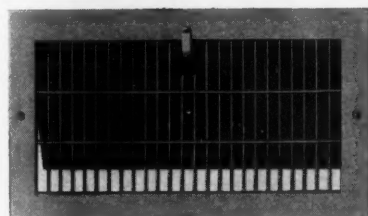
INDEPENDENT "FABRIKATED"

REG. U. S. PAT. OFF.

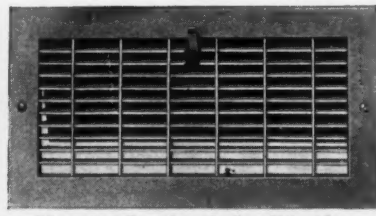
Air Conditioning Registers and Grilles

"Fabrikated" construction presents fine appearance, is strong and most rigid. "Fabrikated" registers and grilles give more than usual free area, affording greater capacities. The steel outer frame is welded to form a solid piece. The grille bars are steel strips set on edge and held firmly by openings cut in outer frame. All registers shown can be furnished as grilles, without valves. Any size, any finish.

THE INDEPENDENT REGISTER COMPANY
3747 EAST 93rd STREET • CLEVELAND, OHIO

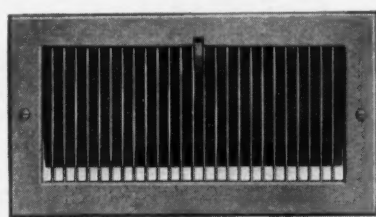


No. 321—Openings in face $\frac{3}{8}$ " wide. Grille bars $\frac{1}{2}$ " deep.

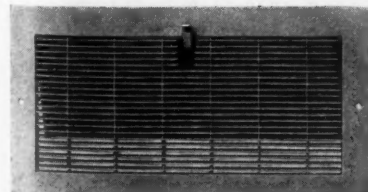


No. 311—Openings in face $\frac{3}{8}$ " wide. Grille bars $\frac{1}{2}$ " deep.

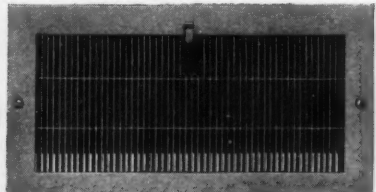
These numbers are of "Fabrikated" construction, but the grille bars are set permanently at the factory for straight outward flow; but on order can be set to deflect air to any angle or combination of angles. Can not be adjusted after registers are installed.



No. 211—Openings in face $\frac{3}{8}$ " wide. Grille bars $\frac{3}{8}$ " deep.



No. 312



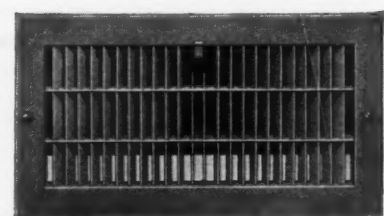
No. 322

"FABRIKATED" FINE-MESH REGISTERS

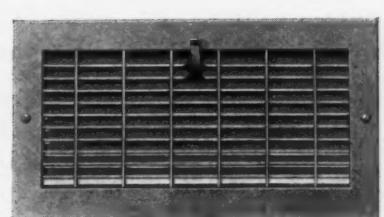
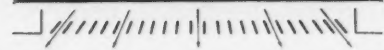
Small openings present low visibility—are "pencil-proof." Grille bars are permanently set for straight outward flow of air, but on order can be set at any angle or combination of angles.

INDEPENDENT "FABRIKATED" ADJUSTABLE DIRECTED AIR FLOW REGISTERS

Grille bars may be adjusted either before or after installing to deflect air flows accurately to any desired angle, up or down or sideways, or to any combination of angles, similar to that below.

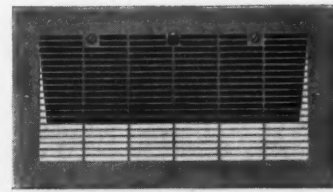
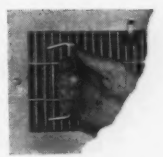


No. 321-A—Diagram shows grille bars adjusted for fan-wise air flow.

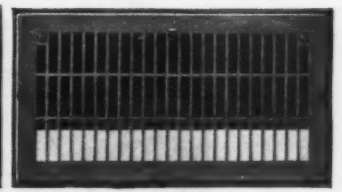


No. 311-A—Here grille bars are set to deflect air downward. They may be set at any other angle or angles.

Each grille bar can be set individually with hand tool accompanying each shipment.



No. 136



No. 137

INDEPENDENT WROUGHT STEEL REGISTERS

This line does not compete with "Fabrikated." It affords the trade a line of air conditioning registers of fine appearance which can be used to advantage on low-priced installations. Made in both wall and baseboard types.

B-129

WRITE FOR CATALOG AND DATA BOOK

**DO BETTER WORK
WITH GRANITE CITY**
Soft forming
GALVANIZED SHEETS



Easy working sheets will help you turn out finer looking sheet metal jobs. Bends will be truer, seams tighter, and joints neater. And these desirable results will be obtained with less work and a saving in time if you use Granite City Soft Forming Sheets, because they are uniform in ductility, gauge and size.

Other characteristics found in Granite City Soft Forming Galvanized Sheets which make for better finished jobs are an even, generous, tight coating of speiter; bright, uniform spangles; and unusual resistance to corrosion (especially, of course, in the copper bearing grades).

Ask your jobber to furnish Granite City Soft Forming Sheets on your next order.



GRANITE CITY STEEL CO.

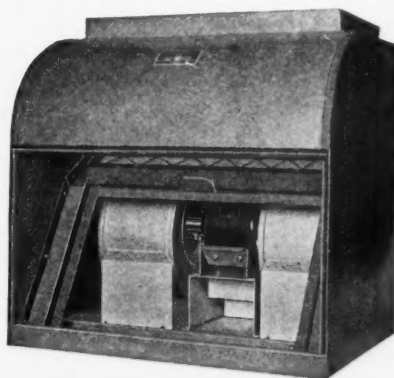
GRANITE CITY, ILLINOIS

1803 Boatmen's Bank Building, St. Louis • 8 South Michigan Boulevard, Chicago • 1104 R. A. Long Building, Kansas City
1602 Mariner Tower, Milwaukee • 1613 Pioneer Building, St. Paul • 4000 York Street, Denver • 77 McCall Place, Memphis

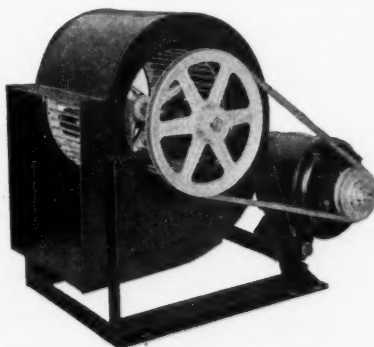
Peerless Announces a Complete New Line of Blower Equipment at New Low Prices



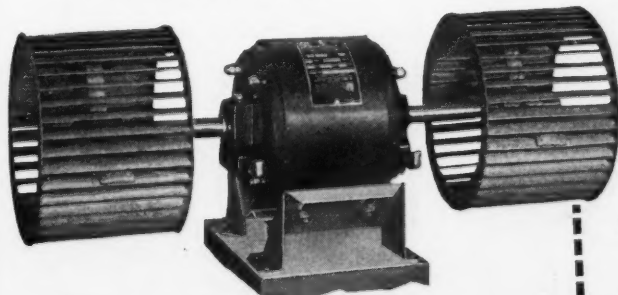
Peerless direct-drive blower assembly for warm air furnaces or air conditioning units.



Peerless package units — direct-drive or belt-drive—with new beautifully finished cabinets.



Peerless Blower Assembly with either top or rear mounted motor.



Peerless motors or wheels are sold separately to manufacturers of blower or air conditioning units.

New Automatic Two-Speed Direct-Drive Blowers Eliminate Transformer Controller

• In its completely redesigned line of direct-drive and belt-drive blowers the Peerless Electric Company has combined three outstanding advantages — *automatic* two-speed control—low price—low power consumption.

Two-speed control on both belt-drive and direct-drive models is entirely *automatic* without the use of a transformer controller. On belt-drive models, *automatic* two-speed control is secured without changing pulleys—an advantage every dealer will appreciate.

New direct-drive blowers offer a wide range of speeds. With the new Peerless standard model three speeds are available from which the two best adapted to requirements can be selected for *automatic* two-speed control. On de-luxe direct-drive models eight speeds are available, offering a wide range from which to select the two for *automatic* control.

Whichever you select, direct-drive or belt-drive, you can be sure of economical operation because Peerless makes the motor—and Peerless has been building quality electrical equipment for more than 46 years—equipment that has won an enviable reputation for low power consumption.

For prices of the new line of Peerless blowers and blower equipment—write for the 1939 Peerless price list. The entire Peerless blower line has been re-priced. Peerless prices are now lower. You'll be agreeably surprised when you compare the new prices of Peerless direct-drive blowers. Mail the coupon today.

NO PULLEYS
TO CHANGE
ON NEW BELT-
DRIVE MODELS

THE PEERLESS ELECTRIC CO., WARREN, OHIO

Please send me the new Peerless blower
catalogs and price list.

Name

Address

City and State.....

Every Kind and Description of SHEET METAL WORKING TOOLS AND MACHINERY

THIS year, everyone agrees, there will be more work than last simply because folks have more money and both new construction or remodeling is so easily financed. But, as usual, the well-equipped shops—those which turn out the better class of work at moderate cost—will get the bulk of the business.

Right today, many sheet metal men are putting their shops in order for spring work. We can tell because of the large number of inquiries for new tools and machinery—for information on Pittsburgh Lock Machines, Brakes, Punches, Folders, Shears and the many other hand and electric tools for which the modern shop finds constant need.

Have you given sufficient thought recently to what a modernized shop or even the addition of that one new machine you really need would mean to you? We will be glad to be of help on this at any time and without obligation—with literature, prices and the experience of other users on similar work. The wide experience of our machinery department in the use of all kinds of sheet metal tools and equipment is at your disposal.

THE J. M. & L. A.
OSBORN Co
Manufacturers—Distributors
BUFFALO • CLEVELAND • DETROIT
Metals and Metal Products

MACHINERY DEPARTMENT

ANGLE IRON SHEARS
AND BENDERS

BAR FOLDERS

BENCH MACHINES

BOLT CUTTERS

BRAKES... HAND & POWER

DRILLS & GRINDERS, ELECTRIC

DRILL PRESSES

ELECTRIC TOOLS

FLANGING MACHINES

FORMING ROLLS

GROOVING MACHINES

PITTSBURGH LOCK MACHINES

POWER PRESSES

PUNCHES... HAND & BENCH

ROLL FEEDS

ROTARY MACHINES

RULES & TAPES

SHEARS... HAND & BENCH

SLITTING SHEARS

SQUARING SHEARS

UNISHEARS

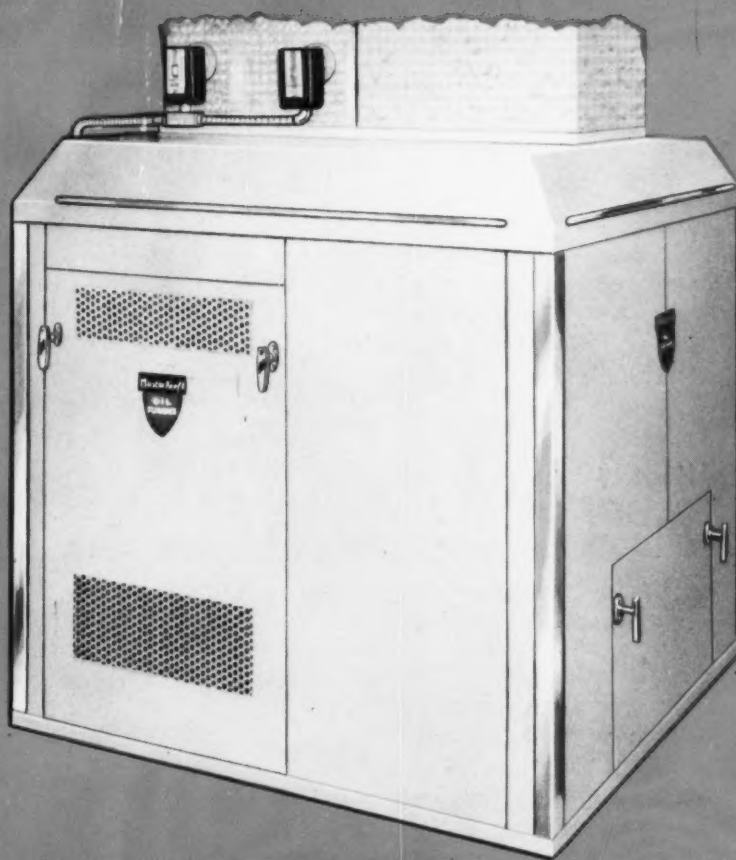
ALL TYPES OF METAL
WORKING HAND AND
BENCH TOOLS

A DEPENDABLE SOURCE OF SUPPLY FOR 80 YEARS

THE GOLDEN OPPORTUNITY OF 1939!!

Master Kraft

*Now offers the
Greatest Value in*
**WARM AIR
CONDITIONING**



**The CLEAN-AIRE
CONDITIONER**

IMPORTANT

This is the greatest improvement over standard warm air heating systems that has ever been offered a dealer. Read the story on the next page →



BUSINESS REPLY CARD
First Class Permit No. 899, P. L. & R., Springfield, Mass.

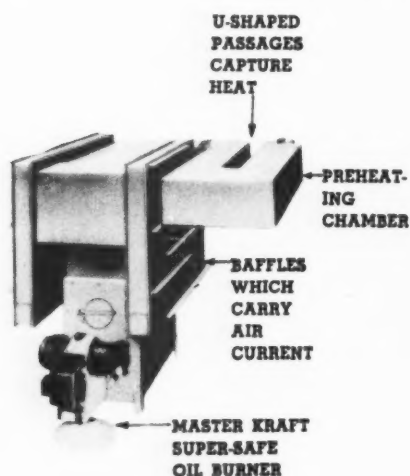
HARVEY-WHIPPLE, INCORPORATED

55 EMERY STREET,
SPRINGFIELD,
MASS.

Postage
Will Be Paid
by
Addressee

HARVEY-WHIPPLE, INCORPORATED

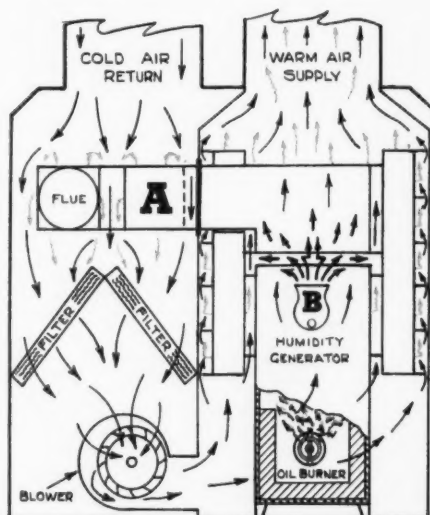
THE AMAZING STORY OF MODERN, FILTERED, PURIFIED, HUMIDIFIED, GENTLY CIRCULATING WARM AIR HEATING—



DEMONSTRATOR

An ingenious miniature demonstrator, a working model of the Clean-Aire Conditioner is available to dealers for explaining to a prospect the wonderful change an installation will make in the home.

At right — Cross-section of Clean-Aire Conditioner. Red arrows show cool air returning from rooms. It is preheated by radiator A, then drawn through filters, thence through blower and heating chamber to rooms. At B, the warm air is humidified by the humidity steam generator.



THE MASTER KRAFT STORY IS BEING TOLD THE WORLD THROUGH DYNAMIC ADVERTISING

RADIO—Over the great radio stations of N.B.C. famous entertainers and world-renowned announcers tell the Master Kraft story to millions of listeners.

BEAUTIFUL LITERATURE—A complete and handsome line of compelling sales literature is available without charge to dealers.

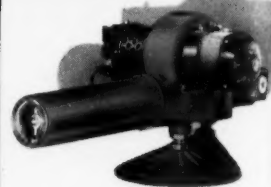
ATTRACTIVE DISPLAYS—Striking display material is available for brightening up your store and attracting customers.

THE MASTER KRAFT FRANCHISE IS THE GOLDEN OPPORTUNITY OF 1939 . . .

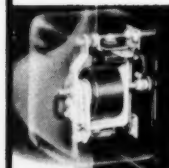
GET THE COMPLETE STORY

USE THE POST CARD

HARVEY-WHIPPLE, INCORPORATED
SPRINGFIELD • • MASS.

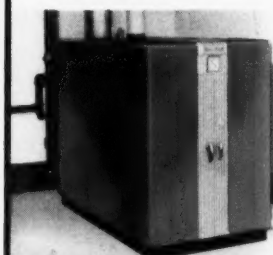


MASTER KRAFT CONVERSION BURNERS FOR ANY SIZE JOB



THE SECRET OF MASTER KRAFT

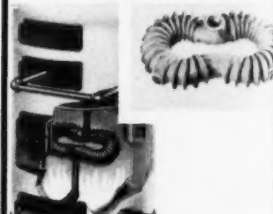
SUPER-SAFETY THE BORKONTROL EXCLUSIVE WITH MASTER KRAFT



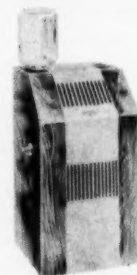
MASTER KRAFT OIL-FIRE BOILER — SOUNDLY DESIGNED



MASTER KRAFT TANKLESS HEATER — HOT WATER WITHOUT STORAGE TANK



MASTER KRAFT FUEL SAVER — ADDS 100 SQ. FT. OF HEATING SURFACE



MASTER KRAFT SUPER ROOM COOLER



Harvey-Whipple, Inc.
Springfield, Mass.

Please send me complete information on the Master Kraft Clean-Aire Conditioner.

Name _____

Firm _____

Address _____

City _____ State _____

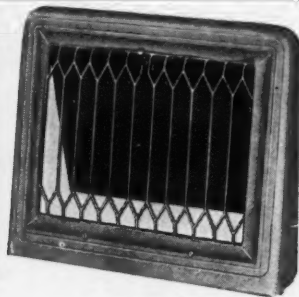
Now Handle _____

HARVEY-WHIPPLE, INCORPORATED

U.S. SUPPLIES THE HEATING AND AIR CONDITIONING INDUSTRY WITH THE NEWEST DEVELOPMENTS IN REGISTERS and GRILLES AT COMPETITIVELY ARRANGED PRICES



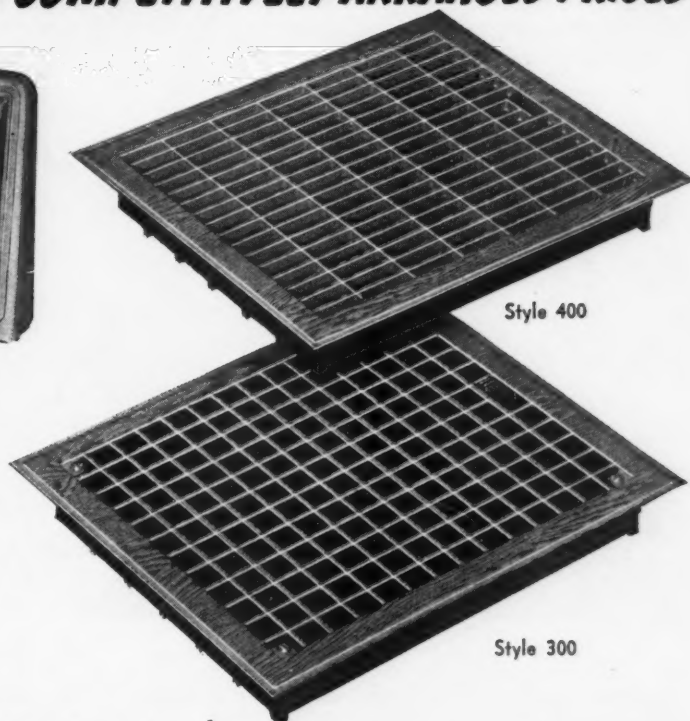
NATIONAL



PANAMA

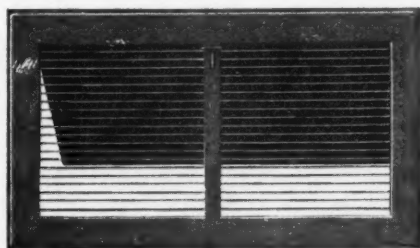
The swing is to U. S. this year! Never before have we had such values to offer. Alert dealers in all sections are selecting U. S. Registers and Grilles for their quality construction that insures complete satisfaction on every heating system.

From the ever-popular National and Panama Designs to the Superbly Constructed U. S. Truss-steel and Steel Embossed Registers, you can't find better values for your Gravity heating jobs.



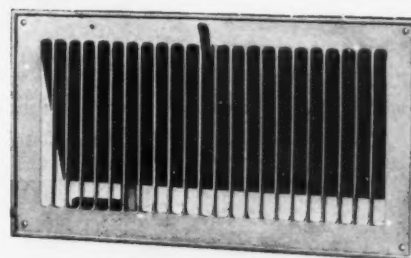
Style 400

Style 300

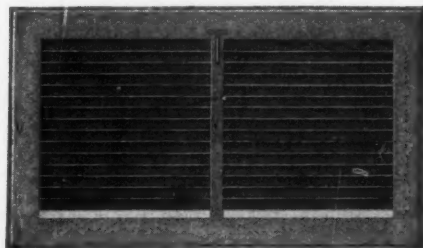


Style 153—Louver-Type Register

The new Inset Panels for U. S. Louver-Type and Adjustable-Bar Registers, now give you all directional flows with the minimum of register stocks. Add to these the plain vertical bar AC Registers at new low lists and you're equipped to handle every class of Air-Conditioning installation.



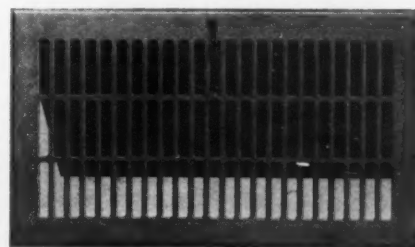
Style 102—Vertical Bar Design
Bars folded and pinched



Style 145—Adjustable-Bar Register

SPECIAL!!

Rubber Sealing Gaskets are standard equipment now on all lines. Another real feature: All types of Air-Conditioning Register Frames are interchangeable with all styles of U. S. Air-Conditioning Registers.



Style 103—One-Piece Sidewall



Send for New 1939 Edition of Catalog No. 27

UNITED STATES REGISTER CO.

BATTLE CREEK, MICHIGAN

MINNEAPOLIS • KANSAS CITY • ALBANY • SAN FRANCISCO • NEW YORK, N. Y.

Applying Anaconda Through-Wall Flashing, North Providence High School, Providence, R. I. Architect: Milton F. MacIntosh, Providence. Sheet Metal Contractor: Eagle Cornice Company, Providence.

Anaconda Through-Wall Flashing

*Efficient, durable, inexpensive
adaptable to almost every masonry
or brick condition*

Anaconda Through-Wall Flashing* has these worthwhile features:

1. Zig-zag corrugations, 7/32" high, provide complete mortar bond in all lateral directions.
2. An integral die-stamped dam, also 7/32" high, gives complete drainage in the desired direction. Flashing drains itself dry on a level bed, reducing possibility of wet walls and heaving by frost.
3. Flat selvage permits neat, sharp bends for counter-flashing or for locking to adjacent sheet metal.
4. Through-Wall Flashing is easily locked endwise by nesting corrugations. Such joints are water-tight, but,

if desired, are easily soldered because of adjoining flat surfaces.

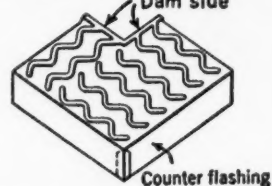
5. Tongue of dam is so designed that it may be placed within 1/4" of face of wall, protecting more of the wet portion of the wall, and still providing ample bed for efficient pointing with mortar.

Anaconda Through-Wall Flashing, readily obtainable from Anaconda wholesalers, is made of 16-oz. copper—either plain or lead-coated. It is furnished in 5' and 8' lengths, in standard and special widths with various selvages, and corner flashing for 8" and 12" walls.

Anaconda Publication C-28 contains complete description of and suggested specification for Anaconda Through-Wall Flashing.

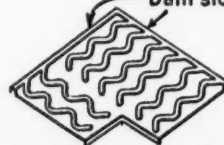
³⁹⁸⁷
*Patent No. 1,906,674

INSIDE CORNER FLASHING



Standard inside corner flashing unit. Dam on inside; drains out.

OUTSIDE CORNER FLASHING



Standard outside corner flashing unit. Dam on outside; drains in.



Anaconda Copper

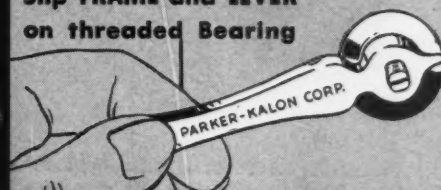
THE AMERICAN BRASS COMPANY • GENERAL OFFICES: WATERBURY, CONNECTICUT
In Canada: Anaconda American Brass Ltd., New Toronto, Ont. • Subsidiary of Anaconda Copper Mining Company

The **NEATEST, SIMPLEST,
TIME-SAVING,
WORK-SAVING**

*Damper Regulator Set
you ever saw!*

**INSTALLED
IN A JIFFY!**

**Slip FRAME and LEVER
on threaded Bearing**



**Turn on WING NUT
—tighten**



**Jiffy Regulator
Set installed.
Note how Lever
indicates posi-
tion of damper
in duct.**



**Jiffy
FEATURES**



SPEEDY—Installed in a jiffy
ECONOMICAL—Cost only a few cents
EFFICIENT—Positive damper control
... no rattles
ADAPTABLE—Fits round or rectangular
dampers up to 10"
DURABLE—Heavy gauge steel, zinc plated
SAFE TO HANDLE—No rough edges
HANDY COMPLETE SET—Ready to install

Illustrated; Parker-Kalon Jiffy Regulator Set No. 7

PARKER-KALON *Jiffy* **REGULATOR SET**

In the palm of your hand, the neatest, simplest damper regulating unit ever presented: The new low cost, high speed "Jiffy".

See how simple this "Jiffy" set is—only a lever, a frame, a wing nut, two bearings and the necessary rivets and bolts. Quickly installed, too,—assembled and tightened to a non-slipping, non-rattling set-up in a jiffy. The answer to your demand for a low-priced, efficient regulating device for domestic air conditioning and furnace installations, this inexpensive unit will help you save time, save money and save labor on your jobs. Parker-Kalon Corporation, 200 Varick Street, New York.

Also—IMPROVED Dial DAMPER REGULATOR SETS with NEW SPRING-IN BEARING

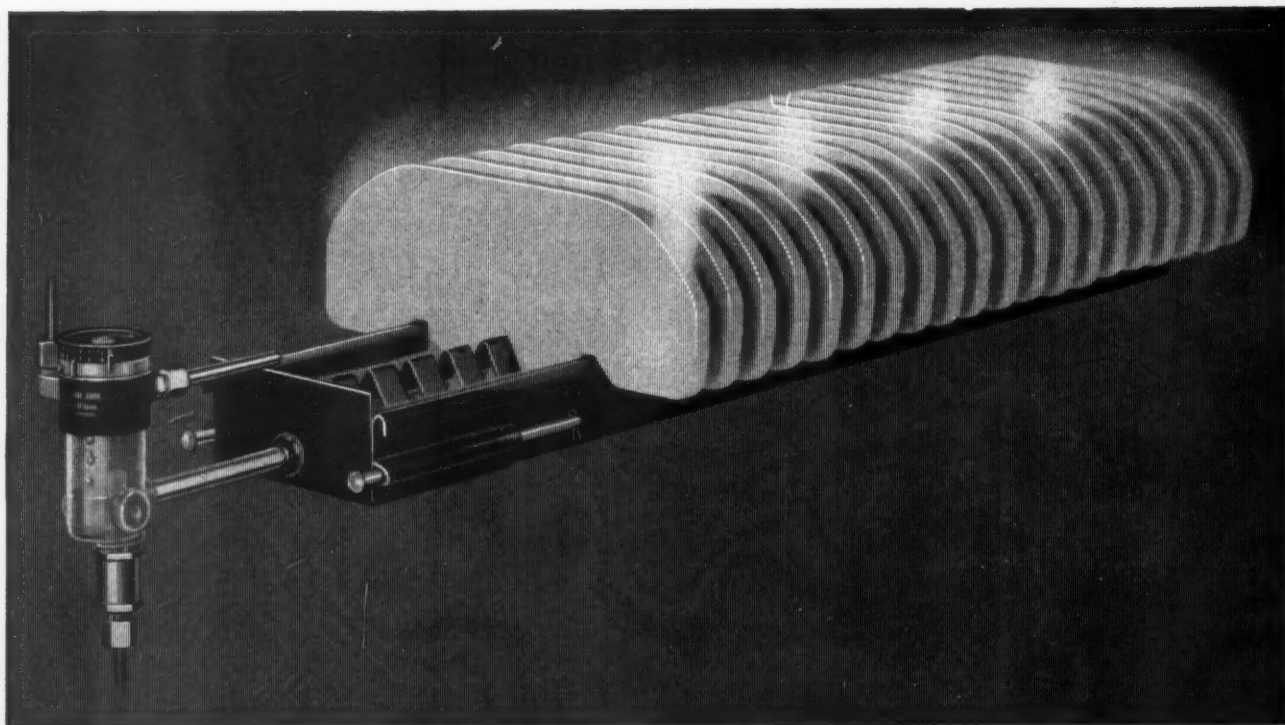


Now the famous Parker-Kalon Dial Regulator Sets (1/4" for dampers up to 10"; 3/8" for dampers up to 20") will be more popular than ever—because:

- (1) New self-locking Spring-in Round-end Bearing simplifies and speeds up installation of damper.
- (2) Frame redesigned to eliminate damper rattles.
- (3) Locking nut with key, supplied in place of Wing Nut, for tamper-proof installations, when desired.
- (4) Now available made of brass as well as of steel.

PARKER-KALON CORPORATION, NEW YORK

Sold only through Recognized Distributors



MONMOUTH VAPOR DIFFUSER

Completely Meets Every Requirement of Humidification

AMPLE EVAPORATING CAPACITY: Each "Monite" Plate equals 50 sq. inches of water surface. The 4" wide pan, filled with plates, can evaporate as much as a 50" wide pan of same length. Monmouth pans come in many lengths.

FOR AIR CONDITIONING FURNACES: Monmouth evaporators can raise the humidity as much as required even in average winter weather, when intermittent firing and low bonnet temperatures make ordinary evaporators fail.

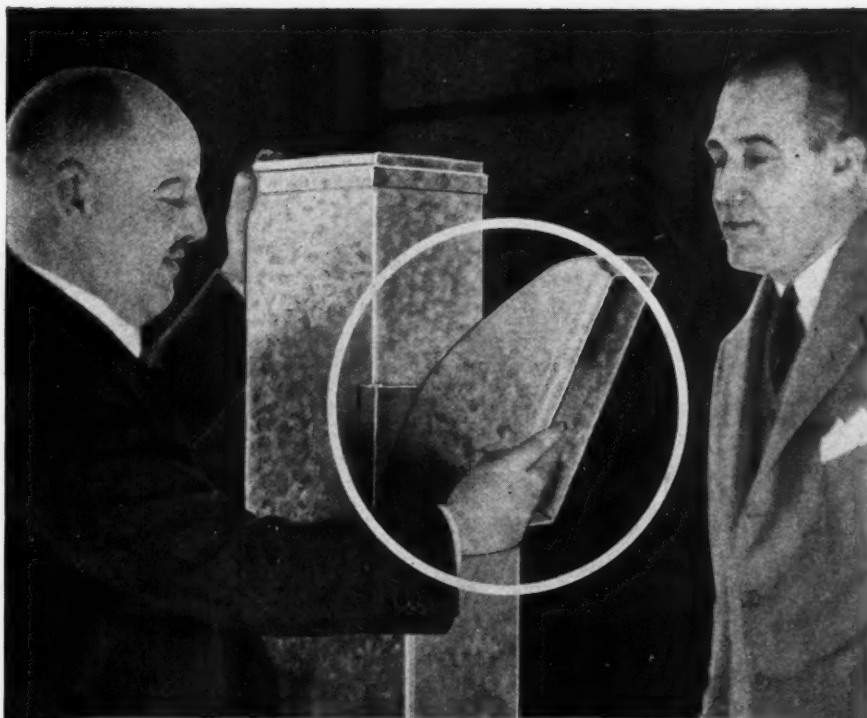
KNOWN CAPACITY: Monmouth publishes exactly what size vapor diffuser each size and type of furnace needs and how much humidifying it will do. Monmouth engineers do not guess.

WITH LIME-LOADED WATER: Monmouth vapor diffusers and non-liming controls will operate satisfactorily. The plates evaporate only water and retain the lime. Monmouth chemical reconditioner removes the lime from the plates.

Six years of development research assures you that Monmouth Humidification is RIGHT. For complete information address Monmouth Products, Inc., 1933 E. 61st, Cleveland, O.

AUTOMATIC  **JUNE**

GRADUATED HUMIDITY CONTROL



**MUELLER ANNOUNCES
PRE-FABRICATED DUCTS
AND FITTINGS**

MUELLER PRE-FABRICATED SYSTEMS OFFER DISTINCT ADVANTAGES TO YOU

Mueller "Pre-fab" Systems—of famed Mueller quality throughout—present you these six superior features:

1. Definite capacity rating.
2. Least "man-hours" installation time.
3. Fewest number of items.
4. Flexibility to meet building conditions.
5. Lowest investment for complete stock.
6. Lowest over-all cost.

Increase your profit. Sell the complete matched Mueller System. Cut your cost of handling. Make more on installation. March ahead with Mueller—"The All-Star Line for 1939." Get in touch with your Mueller jobber today or write us direct.

1 H. P. MUELLER approves patented takeoff fitting as part of new Mueller Pre-fabricated Line. Increased profit looms for dealers due to lower handling cost and smaller inventory stock, as new link is added to Mueller—"THE MOST COMPLETE LINE IN THE INDUSTRY."



2 Mueller engineering again distinguishes itself. Mueller Pre-fab Fittings secure low resistance; cut cost of duct work; scientific design results in a practically self-balancing system.



3 Streamlined Buying. Fewer items provide unlimited combinations. Simplify buying, handling, installation. Now purchase materials—from heating units to ducts, fittings, registers and accessories from one source—Mueller.



4 Neat. Built-up from parts in stock. Mueller Pre-fab makes a clean-looking installation. Simple, easy to use.

MUELLER  MILWAUKEE

HEATING AND AIR CONDITIONING
COAL · OIL · GAS

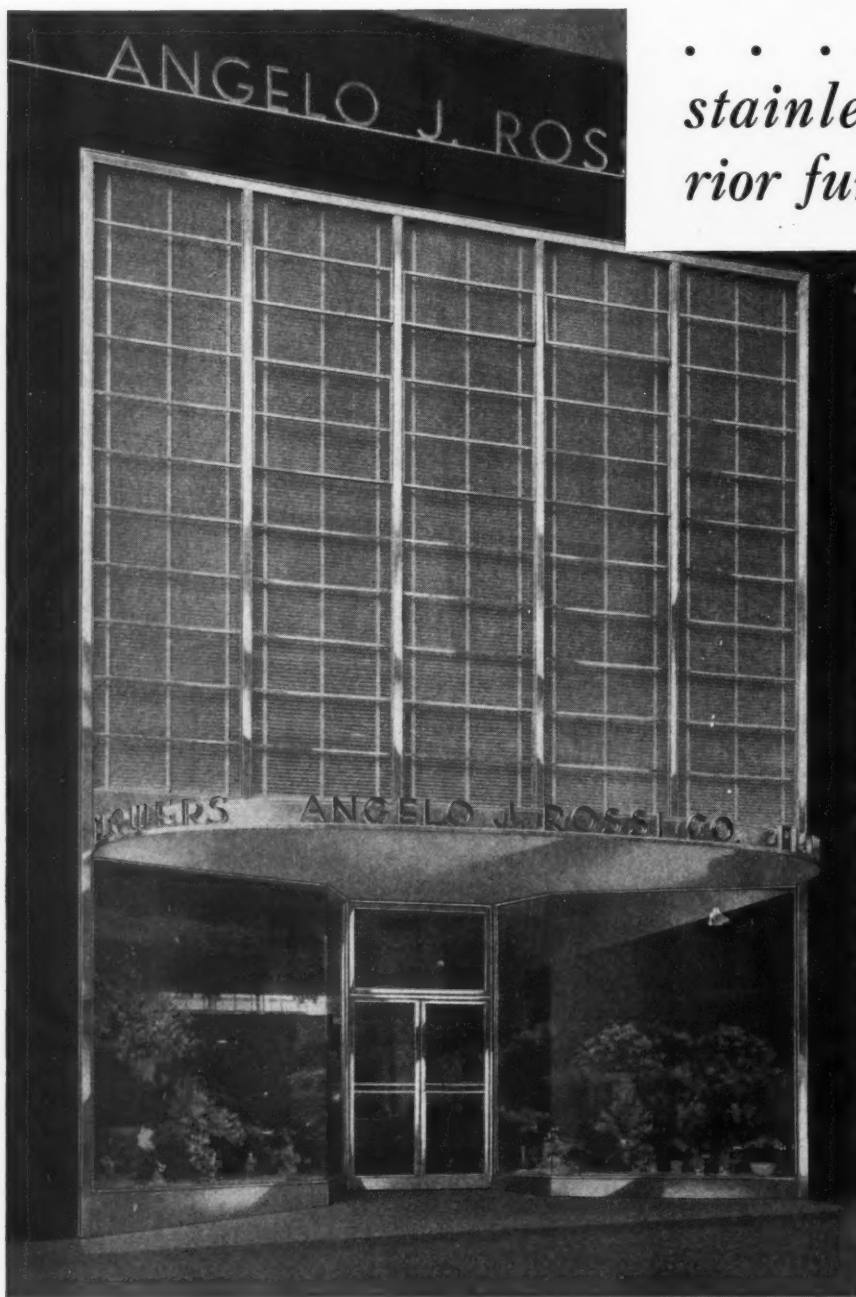
MARCH AHEAD WITH MUELLER by sending this coupon today.

L. J. MUELLER FURNACE CO.
2010 West Oklahoma Avenue, Milwaukee, Wisconsin
Please send literature and full information on Mueller Pre-fabricated Duct Systems.

Name _____
Address _____
City _____ State _____

The Mayor was so *Pleased* with his **STAINLESS** Store Front

. . . *that he adopted
stainless steel for inte-
rior furnishings, too!*



THIS is another example of how one installation of U·S·S Stainless Steel attracts so much favorable attention that it helps get more business for the ornamental metal worker.

Angelo J. Rossi, Mayor of San Francisco, is the owner of this flower shop, located in the heart of the city's retail district. So pleased was he with the attractive appearance of his new U·S·S Stainless Steel Store Front, that he completely refitted and refurnished the interior of his shop with this permanent, bright metal.

Chairs, tables, railings, and flower pedestals, as well as the original store front job, constituted a profitable series of orders for the metal working company that handled this business.

That's the beauty of U·S·S Stainless Steel. It makes possible such modern, attractive effects that it never fails to please the owner. And every one who sees it is a prospect for work done in this metal. An installation like this is your best advertisement. Are you getting your share of this valuable business? Write us for complete information.

FOGS AND RAINS at their worst will never dull the brilliant beauty of this store front, built entirely of U·S·S Stainless Steel and glass. Fabricated by Seipel Ornamental Iron Works, San Francisco. Architect: Timothy L. Pfeuger, San Francisco.

U·S·S STAINLESS STEEL

AMERICAN STEEL & WIRE COMPANY, Cleveland, Chicago and New York

CARNEGIE-ILLINOIS STEEL CORPORATION, Pittsburgh and Chicago

NATIONAL TUBE COMPANY, Pittsburgh

Columbia Steel Company, San Francisco, Pacific Coast Distributors · United States Steel Products Company, New York, Export Distributors

Scully Steel Products Company, Chicago, Warehouse Distributors



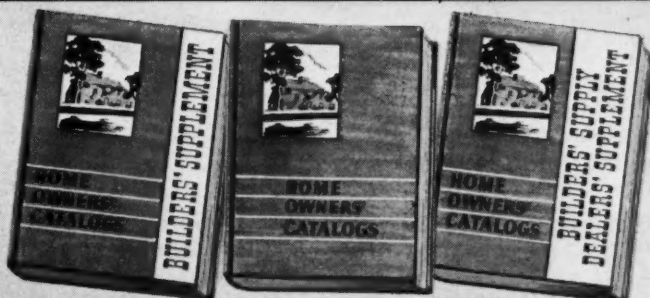
UNITED STATES STEEL

SUNBEAM

WARM AIR FURNACES AND AIR CONDITIONING UNITS

**SUNBEAM
ADVERTISING**
is aimed directly at
your local market

Give You
**THE LION'S SHARE OF THE
NEW HOME MARKET** *for 1939*



**8,000
Builders**

**60,000
Home Owners**

**5,000
Builder's
Supply Dealers**

HOME OWNER'S CATALOGS, carrying the complete Sunbeam Air Conditioning story will be sent directly to your prospects who will definitely build new homes this year. This same important Sunbeam message is now in the hands of thousands of Builders and Builder's Supply Dealers everywhere.



SUNBEAM'S SELLING BOOK is the most effective selling book ever offered the Heating and Air Conditioning Trade. It tells the complete Sunbeam Story. IT SELLS!

SWEET'S CATALOG, a 5-volume working tool containing the Sunbeam story goes to thousands of architects, building contractors and realtors. It will win "building dollars" for you.



New home construction is "ON THE UP." All reports from the F. W. Dodge Corporation and from other authorities on building statistics definitely point in that direction. In some quarters it has been predicted that 1939 will be the best year in home construction since the boom year of 1929.

"FINE," we all say and SUNBEAM proposes to help you do something about it. First by providing you with a complete line of furnaces and air conditioning units . . . for GAS, OIL and COAL. And then by supporting you with a program of advertising that is aimed directly at your local prospects. Look at part of this plan shown opposite and then use the coupon.

SUNBEAM ENGINEERING SCHOOLS

Sunbeam Schools . . . practical, instructive, helpful . . . are now being held in many different localities. Plan now to attend. Use the coupon.

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DIVISION**
OF AMERICAN RADIATOR COMPANY
ELYRIA, OHIO

FOX FURNACE DIVISION of American Radiator Company, ELYRIA, OHIO

- ☐ Please send me complete details of your selling and advertising plans.
- ☐ Please give me data on the Sunbeam Air Conditioning Engineering Schools to be held in or near my city.

Name _____

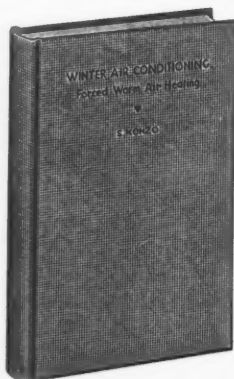
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City _____ State _____

AA-2-39

NOW READY!

*The book all heating men
have been waiting for*



WINTER AIR CONDITIONING FORCED WARM AIR HEATING

532 Pages . . . 6" x 9" . . . Cloth Bound . . . \$3.00

By S. KONZO

*Research Assistant Professor
University of Illinois.*

Now, at last, there is available for heating men, in regular book form, a complete record of the results of the exhaustive studies of forced warm air heating carried out over a period of several years at the University of Illinois Research Residence. This newly published volume, **WINTER AIR CONDITIONING** embodies ALL of the vast fund of practical knowledge which has come out of the investigations. It is filled with basic information that heating men everywhere will find invaluable as a guide to correct and up-to-date practice in the design and installation of forced air heating and residential air conditioning systems.

The author, S. Konzo, actually lived in the Research Residence during the entire period of the studies, and himself conducted or had a hand in every one of the innumerable tests that were made on the Residence forced air system. Konzo was chosen to organize and analyze the test findings for the industry in permanent book form not only because of his first hand knowledge of the test results, but also because of his ability to write clearly and concisely. In **WINTER AIR CONDITIONING** he has turned out a volume that will, without question, quickly become, and for years remain, the "bible" of the forced warm air heating industry.

CHAPTER HEADINGS

- | | | |
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| 1. The Development of the Forced-Air Heating System | 11. Heat Loss Calculations for Heating | 20. Registers and Grilles |
| 2. Comparison of the Gravity Warm-Air Heating Plant and the Forced-Air Heating Plant. | 12. Reduction of Heat Loss from House, and Insulation | 21. Register Air Temperatures and Heat Loss from Ducts |
| 3. Winter Air Conditioning and Human Comfort. | 13. Air Volumes, Air Densities, and Register Air Temperatures | 22. Velocity Pressure, Static Pressure, and Total Pressure |
| 4. Wet- and Dry-Bulb Temperatures and Relative Humidity | 14. General Performance Characteristics of a Forced-Air Heating System | 23. Pressure Losses and Fan Ratings |
| 5. Comfort Chart and Effective Temperatures | 15. The Use of Dampers in Duct Systems | 24. Pressure Losses of Registers, Ducts and Fittings |
| 6. Humidification Requirements and Limitations | 16. Bonnets, Baffles, and Bonnet Air Temperatures | 25. Measurement of Air Velocities |
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| 9. Filtration of Air and Air Filters | 19. Field Tests on Register Performance | 28. Trunk Duct Systems |
| 10. Room Air Temperatures—Differentials and Variations | | 29. Special Modified Forms of Duct Design |
| | | 30. Selection of Furnaces and Burners |
| | | 31. Furnace Capacities and Efficiencies |
| | | 32. Chimneys and Draft |

WINTER AIR CONDITIONING belongs in the hands of every one interested in forced air heating or residential air conditioning. As this book has been published by the National Warm Air Heating and Air Conditioning Association primarily to make its invaluable data readily available to all, it is offered to the industry at the low, non-profit price of only \$3.00 per copy. To obtain a copy promptly send your order and remittance today to the address below.

KEENEY PUBLISHING COMPANY

6 North Michigan Avenue

Chicago, Illinois



*400 Miles of Steel ...
to light your Cigarette*

THAT book of matches in your pocket would fall apart except for that inconspicuous piece of stapling wire. It takes approximately 444 miles of that wire every day to supply the enormous demand for book matches.

Steel is even more important in almost every act of your daily life. Many food delicacies come to you in tin plated steel cans and are cooked on a steel range; the modern plumbing and heating of your house would be impossible except for steel; your clothes, glasses, watch, shoes....all contain vital steel parts; you probably travel in a steel automobile or train to a steel framed office building or factory, to work at a steel desk or machine.

All the comforts and conveniences of modern life, which have come to be considered necessities, have been made possible by modern refinements in steels. Such refinements in steels do not just happen.... Youngstown maintains a great laboratory and an experienced organization, always working with customers to find the steel best suited to their needs and products.

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YOUNGSTOWN

There's business to be had if you go after it

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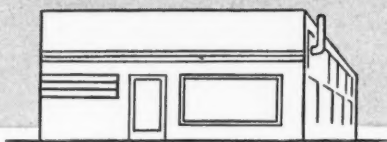
ENDURO

STAINLESS STEEL



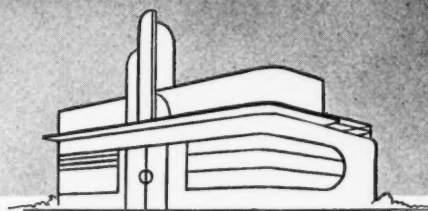
IN EVERY HOME

—there are dozens of uses for ENDURO Stainless Steel—sinks to be fabricated, shower stalls and bathroom molding, decorative stair panels, bars for rumpus rooms, splash panels around stoves, tops for work tables, strip to cover linoleum joints, stove pipe that needs no replacement and many others. Keep your eyes open when you are doing roofing and furnace work. You'll be amazed at the new business you can build up and the profits you can gather if you suggest some of these improvements. And you can do it without additional sales cost while you are estimating or doing another job.



IN EVERY LAUNDRY

—you will find conditions that cry out for stainless steel—plenty of water, steam and the need for cleanliness, sanitation and a metal that will not rust or stain clothing. Look in your local telephone directory. Every laundry of any size is a prospect. Call on them and tell them that you can help them to cut plant maintenance costs. This is sweet music in such a competitive business. Then tell them about ENDURO, play up its freedom from rusting and its long life. You'll find that they will remember you when sheet metal now in use must be replaced.

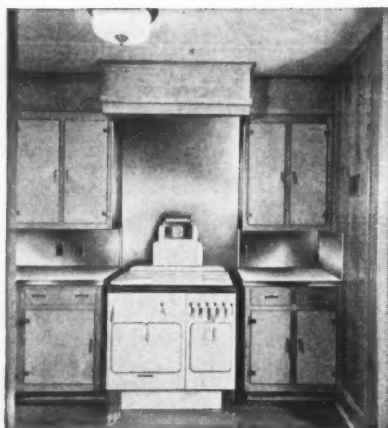


IN EVERY RESTAURANT

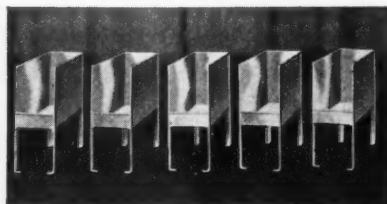
—the clean, silvery, sanitary qualities of ENDURO Stainless Steel are a business builder for the restaurant owner. That means business for the sheet metal contractor who sells the idea, making counter and table tops, sinks, steam tables, food cabinets, pie racks, vegetable bins and similar devices of this practically everlasting steel. You'll find that it isn't difficult to work—can be formed, welded, brazed, soldered and joints polished with your regular equipment. The sales and profit possibilities of ENDURO are unlimited, but you must go after the business if you want it.

REPUBLIC STEEL CORPORATION

General Offices, Cleveland, Ohio • Alloy Steel Division, Massillon, Ohio



Drainboards and range hood of ENDURO in model home



These laundry boxes were made in a sheet metal shop



More than a ton of ENDURO in these restaurant fixtures

REG. U. S. PAT. OFF.



*Reg. U. S. Pat. Off.

Republic makes a complete line of black, galvanized and galvanized sheets of steel and rust-resisting Toncan Copper Molybdenum Iron. Also Taylor roofing ternes.

BERGER MANUFACTURING DIVISION
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A very practical booklet telling how to fabricate stainless steel will be sent to you upon request.



Association Problems

AS this issue of American Artisan goes into the mails, the convention season for our industry is getting into full swing. Already Illinois and Indiana have held two-day sessions; other meetings will follow in rapid order during February and March.

After several years of attendance at state conventions we wonder how many contractors appreciate the time, money and energy officers and committee members give gratis to the preparation of the program, the securing of speakers, the making of hotel and entertainment arrangements. And it must be discouraging to officers to find attendance small, and interest seemingly so lacking that men cannot be pried out of their seats to ask questions or engage in discussion.

It has been interesting to watch, by way of contrast, the various conferences (air conditioning, coal, oil burner, cooling) which have become popular during the last four years. Those attending come with notebooks and pencils, they attend every session (getting in on time and staying until the end); they rise to their feet to ask questions or contribute to discussions—in short they came to gain knowledge and nothing stops them from accomplishing that purpose.

Perhaps the conventions of our own craft; the speakers; the subjects; the arrangement of the program have not furnished the things men in this industry are seeking. Perhaps contractors attend their own conventions to have a good time. Perhaps the sessions should be held at night at some local "bright spot."

As one speaker recently said—"Will someone here tell me why this industry of ours can't organize. Can't have huge memberships? Why everyone in this busi-

ness, be he ethical or chiseler, big operator or five-furnace dealer, from big city or small town, doesn't belong to this association?"

Maybe there is no complete answer. Maybe men have been going to conventions, listening to the same men say the same things, seeing the same faces, accepting the same kind of entertainment, so long that they no longer find anything of interest.

Maybe men want to hear and study subjects far more technical than anything convention committees have so far dared to offer.

Maybe men do not want anything more technical than a few parlor stories or sessions should be dispensed with and several rooms opened in which men can gather, find a place to sit in a comfortable chair and talk business or tell stories to their cronies or men from other areas.

Maybe business is such that men do not feel able to afford the time and expense of a trip to some central city, with two or three days' hotel bills, but might travel a short distance to a district meeting held on one day and evening.

Maybe, maybe, maybe—but why? and how? and what?

The facts are, our associations are no longer truly representative of the industry or the area they purport to represent. Memberships are pitifully small; the old wheel horses keep things moving as best they can, but every association needs new blood, new faces, new shoulders put to the wheel.

Why can't this industry organize?

Why are association memberships so small?

What do the members of this industry want?

1939

Feb. 8-10—United Roofers' Association. Washington, D. C.

Feb. 6-8—WISCONSIN—Master Sheet Metal, Heating, Ventilating and Air Conditioning Contractors Association, Inc. Annual. Plankinton Hotel, Milwaukee. Paul L. Biersach, Secretary.

Feb. 14, 15, 16—OHIO—Ohio Sheet Metal Contractors Association. Annual. Hotel Portage, Akron. H. L. Orton, chairman, Entertainment Committee.

Feb. 28-Mar. 2—MICHIGAN—Sheet Metal & Roofing Contractors Association. Annual. Jackson. Frank E. Ederle, Secy., Grand Rapids.

Mar. 2-4—NEW YORK—State Sheet Metal Roofing & Air Conditioning Contractors' Association. Annual. Ten Eyck Hotel, Albany. Clarence J. Meyer, Secy., 567 Genesee St., Buffalo.

Mar. 8-9—Conference on Air Conditioning. Department of Mechanical Engineering and the Engineering Experiment Station of the College of Engineering, University of Illinois, Urbana. Prof. W. H. Severns, Chairman.

Mar. 23-25—OREGON—State Air Conditioning Conference. Second Annual. Oregon State College, Corvallis.

Mar. 27-30—Forced Warm Air Conference. 8th Annual. MICHIGAN State College, East Lansing. Sponsored by National Warm Air Heating and Air Conditioning Association.

Apr. 11-13—IOWA—Heating and Air Conditioning Conference. Iowa State College, Ames.



The Liesener organization on a rush fall morning with all trucks ready for jobs over a 700 square mile area. H. W. Liesener stands at the left.

A 100-Furnace-a-Year Dealer *in a town of 227 Population*

"SEVERAL years ago some well meaning competitors came to me and said: 'Liesener, if you persist in conducting your business along your present lines, it is only a matter of time till you will be broke and out of business. We're old timers in this business and we should know.'

"I am proud to say that I'm still doing business at the old stand and in the same old way. I've got much to learn, but the fact that I am installing furnaces for the same folks I did work for twenty years ago, or new generations of the same families; that I don't owe any bills; buy for cash and have enough money to pay cash for bargains, seems to prove that my methods can't be far wrong for the type and size of business I do, the type of folks I do business with, and the territory in which I operate."

So H. W. Liesener who, with his brother, conducts the Liesener Hardware Company in Jackson, Wisconsin (population 227, according to the latest census) prefaced his interesting story.

A Sales Record and the Area Covered

In 1937 H. W. Liesener, who operates the furnace and plumbing end of the company while his brother runs the hardware store and sells stoves, installed 65 winter air conditioning systems and 45 gravity furnace systems. Up to September 1, 1938, he had installed 45 winter air conditioning systems; had prospects for more work than he could handle for the fall and early winter and confidently expected to exceed his 1937 sales by the end of the year.

Of course, all these installations were not made in

the little town of Jackson. At the same time, these sales were made not so very far from home, many in small towns, a few in the outlying suburbs of Milwaukee, a goodly number to families living on farms. The area covered by this firm's operations extends roughly 15 miles to the south, 15 miles to the east, 15 miles to the north and 20 miles to the west. In that area there are several small villages, a very few small towns and a vast area of farming country.

Being in a small town, all mechanics are non-union men. Mechanics work ten hours a day (or did last spring before wage-hours came over the horizon); most of the mechanics are men from small towns or the farm since experience has shown that big city men don't like the life; most of these



Jackson, population 227, is not a "big" town. This is "Main Street" looking toward the arterial highway two miles away.

men have been working for Liesener for 15 years or more.

Up until September, twelve mechanics had been kept at work steadily with lost time only because of weather. Some of these men can do only plumbing work; others only furnace work, most of the men both plumbing and furnace work—but each one in his class is a good man who can be trusted on the job without the boss.

Methods Which Keep Men Busy All Year

How to keep these men busy the year round was answered only after several operating methods were tried out. As now conducted, all galvanized iron pipe and stacking, also all tin pipe and stacking are made in the Liesener shop. No fabricated items



Large jobs are not sought for, but this church has a satisfactory Liesener heating installation.

are bought excepting for special rush demands. The men make up standard sizes during the winter months, when the weather shuts down a job, or when, for any reason, there is nothing on the outside under way. At the same time standard sizes of gutter and conductor pipe used locally are made up in quantities—sometimes as much as 5,000 feet of gutter in one continuous schedule. To fill out the necessary items, Liesener is continually on the lookout for bargains in items for cash. On one occasion all the items in the stock of a large manufacturer who was closing out his lines of pipe and



Houses heated are of all types, but generally stand fully exposed and are well constructed.

fittings were bought for cash, even though some of the items may never be used.

Rectangular furnace casings which began to be popular in Liesener's area three or four years ago, are made up in the shop. So are cabinets for blowers, the wheels being purchased in the housing, but without any cabinet. One mechanic who has been with the firm for many years never leaves the shop—his time is taken up with laying out patterns and forming all this work supplemented by the other men during their spare time.

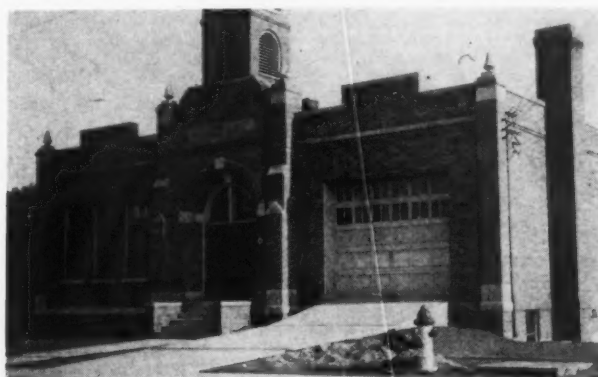
How Sales Are Incubated

The sales plans of this organization are a little unorthodox. For instance, a larger than normal share of all jobs is new house work. Leads to these jobs are turned in by carpenters, masons, electricians, in fact, all trades who have worked with Liesener. These men accept no remuneration for their tips except a little beer or cigars or something of that sort for they know that they will, in turn, get tips from Liesener.

Generally speaking, Liesener does not try too hard to get the "big job"; he believes that the cost of engineering service, selling, is so much higher that profit possibilities are reduced. Only one "big job" was sold in 1937; that was a poultry farm which used some of their own old furnaces and some new ones, but needed 14 new blowers and new duct work—the whole job amounting to \$14,000.

Small Jobs Are Preferred

Instead of the "big job," Liesener believes that many small installations require a minimum of engineering and service, keep his shop and men operating at a steadier pace and at the end of the year show the best profit. Few engineering plans are drawn, sketches are made (usually on the job when figuring) the heat loss is calculated and pipes sized and the reputation of the firm placed behind the job. That reputation, built up during twenty-three years is more impressive, Liesener believes, than all the pretty plans and sales chatter and, since most people know him or the firm these tactics have proved more than satisfactory.



One of Liesener's large jobs—a village hall—heated with forced warm air, and comfortably.



Houses exposed like this are commonplace in the day-to-day job calendar of the contractor catering to a rural or semi-rural area.

Strangely enough, in the work done for farm owners, the farmers have a strong preference for forced warm air—in 1937 only one-fourth of the furnaces sold to farmers were gravity installations. And automatic heating is coming into the picture. In 1937 four stokers were sold; probably six or more will be sold in 1938; a few oil burners were sold in 1937, more will be sold in 1938.

Progress Routine Eliminates Waste

To operate economically over the area covered is, in itself, no matter for guesswork. The routing of all work is based upon a "want list" which shows day by day the jobs under way, their progress, who is working on each job, what will be needed tomorrow or the day after. Even the simple process of

loading a truck is carefully routined. With the furnace and major accessories all required small parts, tools, nails, chain, etc., have been noted down on the call preceding the delivery and when a truck reaches the job there is no need to "run back to the shop for tools or supplies."

Jobs are figured and priced on the first call. To do otherwise costs money in time and car expense; further, buyers in an area like this are sometimes difficult to catch at home, so the installation complete with sketch and cost are delivered immediately. To show owners or buyers who may not know a Liesener job, a picture album filled with photos of houses in which work has been done is a part of the sales kit. The pictures shown here came from the album. Prospects are invited to communicate with any one or all these satisfied customers.

Advertising is Negligible

Advertising in newspapers is not purchased except upon very special occasions. Some small amount of advertising is done in church programs. Circulars are not mailed; such material is left after a call, but Liesener believes that a personal call with perhaps a reminder left behind, is far more productive than indiscriminate mailing to a lot of folks he knows only casually or who do not know him.

By these practices, supplemented by long hours of hard work, this contractor has built a substantial business consistently year after year.

University of Illinois Air Conditioning Conference

The 1939 Conference on Air Conditioning will be held on March 8 and 9 at Room 215, Electrical Engineering Building, University of Illinois, Urbana, according to an announcement by the Department of Mechanical Engineering and the Engineering Experiment Station of the College of Engineering.

All-year comfort air conditioning with its problems and new developments is the subject of the conference, being promoted for the benefit of the small dealer, installer, present owner and prospective owner of comfort air conditioning equipment.

The program follows:

Wednesday, March 8—Morning Session—Chairman: M. L. Enger, Dean of the College of Engineering and Director of the Engineering Experiment Station, University of Illinois.

Address of Welcome—Dean M. L. Enger.

Equipment for All-year Air Conditioning—W. H. Severns, Professor of Mechanical Engineering, and P. E. Mohn, Assistant Professor of Mechanical Engineering, University of Illinois.

Characteristics of Duct Systems and Fans—S. H. Downs, Chief Engineer, Clarage Fan Company, Kalamazoo, Michigan.

Afternoon Session—Chairman: S. H. Downs, Chief Engineer, Clarage Fan Company, Kalamazoo, Michigan.

Introduction and Diffusion of Conditioned Air in Rooms—D. W. Nelson, Assistant Professor of Steam and Gas Engineering, University of Wisconsin, Madison.

Regulation of Air Temperature and Humidity—C. L. Ringquist, The Trane Company, La Crosse, Wisconsin.

Evening Session—Chairman: Dr. A. C. Willard, President, University of Illinois.

Dinner—Placed to be announced. (Make reservations before noon.)

Address: Physiological Responses of the Body to Its Environment—Charles Sheard, Ph.D., Director, Division of Physics and Biophysical Research, The Mayo Foundation and The Mayo Clinic, Rochester, Minnesota.

Thursday, March 9—Morning Session—Chairman: S. I. Rottmayer, Mechanical Engineer, S. R. Lewis, Chicago.

The Cooling Load and Refrigerating Problems in Comfort Air Conditioning—R. E. Gould, Assistant Manager, Air Conditioning

Engineering, Frigidaire Division, General Motors Corporation.

Building Insulation, Types and Applications—S. Konzo, Special Research Assistant Professor of Mechanical Engineering, University of Illinois.

Condensation Problems in Modern Buildings—L. V. Teesdale, Senior Engineer, United States Department of Agriculture Forest Service, Forest Products Laboratory, Madison, Wisconsin.

Afternoon Session—Chairman: O. A. Leutwiler, Professor of Mechanical Engineering Design and Head of Department of Mechanical Engineering, University of Illinois.

Air Conditioning Water Supply and Disposal—W. D. Gerber, Engineer, Illinois State Water Survey, Urbana, Illinois.

Conservation of Water by Using Cooling Towers and Evaporative Condensers—S. I. Rottmayer, Mechanical Engineer, S. R. Lewis, Chicago.

There will be no registration or tuition fee.

The Laboratories of the Department of Mechanical Engineering will be open to visitors during the entire period of the conference. The Research Residence and the Lincoln Hall Theatre will be open from 3:00 p.m. to 6:00 p.m. on both days of the conference.

Make hotel reservations early. The Inman Hotel, Hamilton Hotel, and Beardsley Hotel in Champaign, and the Urbana-Lincoln Hotel and the Hotel Plaza in Urbana offer excellent accommodations at reasonable rates. Lists of rooms in private homes near the campus may be obtained either at the Student Center in the Union Building or at the University Y.M.C.A. Restaurants are available near the campus.

Arrangements are being made for the publication of all of the papers presented, and copies will be sent free to all persons who attend and register.

Address requests for reservations, programs or any additional information to Professor W. H. Severns, Chairman, General Committee, 103 Mechanical Engineering Laboratory, Urbana, Illinois.



Your comment or experience is invited.

PROBLEM CORNER

December Condensation Problem

American Artisan:

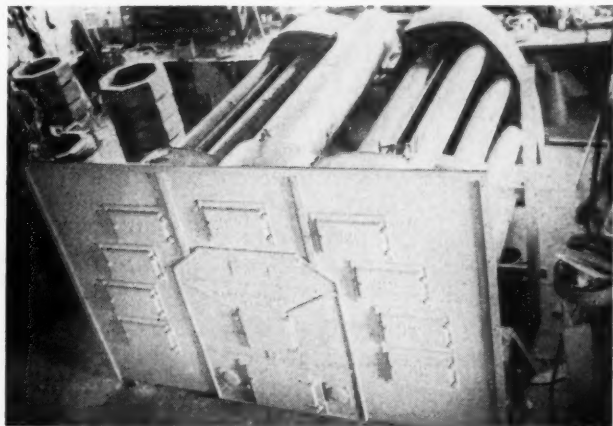
As a suggestion to P. S. P., Tennessee, whose condensation problem appeared in the December issue, our experience may be of some help. We had two similar problems and after we had tried everything we could think of to eliminate excessive moisture an old furnace salesman told us to take a small quantity of outside air. We connected a six inch pipe from the outside to one of the cold air returns and the trouble was over.

E. H. WARD, Lansing, Mich.

Furnace Capacity

American Artisan:

Enclosed are photographs and specifications of a warm air furnace we manufactured and installed in a British Columbia school. This furnace replaced two cast iron furnaces either one of which was supposed to be the largest furnace built in Canada. The furnace dimensions are—width, 10 feet; height, 7 feet; length, 11 feet; weight, 10,000 pounds; square feet of heating surface, 700; square feet of grate area, 24; ratio heating surface to grate area, 29 to 1. The furnace body is $\frac{3}{4}$ -inch boiler plate, reinforced with



heavy channel iron; back of furnace is $\frac{3}{4}$ -inch plate, riveted and welded to body. Body is rolled in one piece. Radiators consist of 4 large boxes and 16 tubes; two boxes at front, two boxes at rear. Tubes connect into boxes as shown with cast iron collars bolted to inside of boxes. Cast iron collars join the body with the boxes. Furnace and radiators are protected by cast iron liners. The furnace will be brick cased and stoker fired.

Can you tell us:

1. Btu output per hour.
2. Warm air pipe area.
3. Cubical contents; heating capacity.
4. If any larger furnace has ever been built in the U. S.?

F. T. D., British Columbia.

Reply by

S. Konzo,
University of Illinois.

The furnace installation which you show is most inter-

esting and so far exceeds in size the small units that it is doubtful whether the conventional methods of rating will be strictly applicable. In other words, the only safe way of determining capacities of such a large unit is by actual test. The following calculations may, however, give some inkling of the probable capacities.

1. The gravity code for rating of warm air furnaces gives:

Leader area in sq. inches equals 1.75 times grate area in sq. inches times correction factor.

In your furnace this Leader rating is equal to 7,135 sq. in. Actually, of course, this gravity rating is more or less meaningless for this furnace.

2. The Btu output at the furnace bonnet can be obtained from the following equation:

Bonnet capacity = GEFC \times correction factor where

G = Grate Area in sq. ft.

E = Bonnet Efficiency

F = Heating Value of Coal

C = Combustion Rate

If a combustion rate of 7.5 lbs. per sq. ft. of grate per hr. together with a 0.65 efficiency is used, the bonnet capacity equals 1,657,000 Btu per hr.

3. It is possible that this large furnace with its ample heating surface may handle a combustion rate as high as 10 lbs. per sq. ft. per hr. Under these conditions the bonnet capacity will be 2,210,000 Btu per hr.

It should be noted that the unknown factor is that of bonnet efficiency. The 0.65 ratio which was used may or may not represent actual efficiency ratios.

The method of figuring the heating capacity of a furnace in terms of the cubical content is liable to be very misleading unless the wall construction, exposure, and other factors affecting the heat loss are known. I have no data on the matter of largeness of your unit. If my memory is good I believe that there are two or three companies in the United States that specialize in large furnaces.

Solder Formula

American Artisan:

Can you give us a manufacturing formula for 50-50 solder, tin and lead. We have a surplus of sheet lead and would like to use it if we can find a formula.

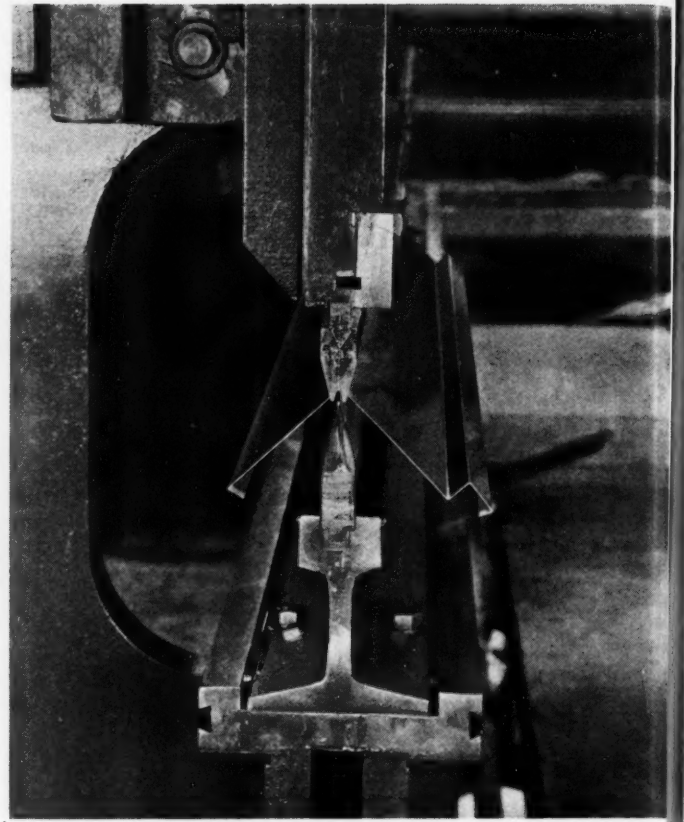
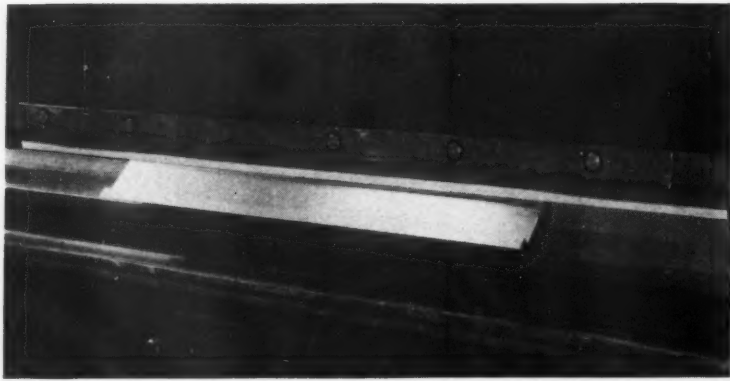
G. K., Illinois.

Reply by The Editors

We have looked through all the books we have in the office without getting any definite information on how to make 50-50 solder. The only information we can secure is that both metals are melted in a graphite or similar crucible at as low a temperature as possible, but probably over a Bunsen burner or large gas burner.

Our information is that the material with the highest melting point should be melted first and in this case it would be lead, with a melting point of 622 deg. F. After the lead is all melted, the tin can be added, which melts at 449 deg. F. When the mixture is all liquid, it is stirred for some little time with an iron rod and the flux or impurities, if any, skimmed off.

Below and right—Two views of adhesive tape applied to brake edges to protect polished surfaces. At bottom of page—hand brake taped with adhesive to prevent marring surface.



Protective Measures Suggested for

Forming Stainless Steel*

IN the fabrication of items of stainless steel, fabricators have learned through experience that certain precautions and changes in methods must be applied if the finished product is to fully portray the inherent qualities of the metal. For example, when stainless steel is formed in the brake or press, the dies and machines must be set to provide for greater spring-back than occurs with ordinary steel. Usually this spring-back is double to triple that for mild steel. With dies, a clearance of approximately .007 inch is satisfactory.

One of the annoying and expensive mistakes is careless failure to protect the sheet surface during

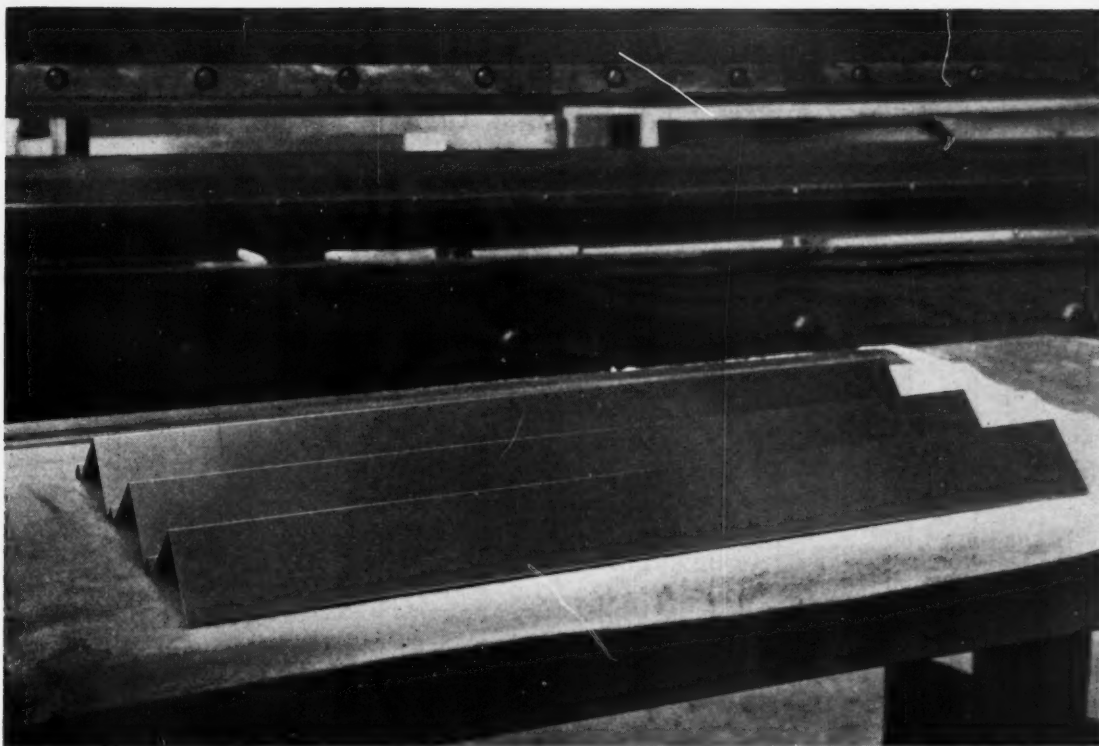
machine operations. Annoying because marring the sheet brings complaints from the buyer and expensive because such marks take time and equipment to remove. This useless expense can be prevented by observing a few basic precautions. These precautions do not require any complicated machine set-ups nor the use of expensive preventatives; everyday materials in the shop can be used.

The photographs which accompany this article show machines equipped to prevent marring. The explanation and the photographs are taken from a manufacturer's booklet,* which, explaining preventatives, says—

"The same dies used in forming steel can be used for stainless steels, although extreme care should

*Condensed from the booklet "The Fabrication of Republic Enduro Stainless Steel," shortly to be issued by Republic Steel Corporation, Cleveland, Ohio. All photographs from the same booklet.





The edges of these dies are covered with tape and the bench is covered with flannel cloth to avoid scratching the sheet.

be taken to have the surface of the dies well burnished or polished, free from tool marks or other indentations. Any marks on the dies will be impressed on the metal being formed.

Lubrication and Protection

"Lubricants similar to that used for drawing or rolling can be applied to the dies to eliminate friction or metal adhesions. This, of course, is satisfactory only on unpolished surfaces.

"Many applications of stainless steel permit the use of mill polished sheets such as No. 4 finish, No. 6 Tampico finish, No. 7 finish and mirror finish. A few of these applications are soda fountain equipment, dairy equipment, meat packing equipment, hospital and kitchen equipment, restaurant and cafeteria equipment and for architectural structural and decorative purposes.

"It has been found that it greatly simplifies the problem to avoid marring the sheet at the start rather than to polish out the marks that have appeared through improper protection in the dies. It is quite difficult to match by hand, on a formed object, the finish that has been put on the sheet at the mill with polishing machines.

"While it is not maintained that it is possible entirely to prevent scratching and galling on all types of work, everything possible should be done to minimize these possibilities.

"Another method which preserves the polished finish of the metal is the application of adhesive tape to the dies. This can be used where the work applied to the metal is not severe, such as in bends or brakes. This type of protection is not recommended for deep drawing. The merit of this type of protection can easily be seen, as it prevents direct contact between the polished surface of the sheet and the hardened steel of the dies.

"In some cases the fabricator applies a coat of

paste and wall paper or Kraft paper to the entire polished or exposed surfaces of the sheets, and permits it to dry. It is then possible to lay off and form all the material without the danger of scratching or abrading the surface. This protective coating can remain on the surface until all assembly has been completed or it can be removed immediately with hot water or steam.

"If soldering or welding, spot welding or similar operations are to be performed, the protection must be removed to obtain metal-to-metal contact at the points to be joined."



Dishing a convex head for a tank formed of stainless steel using a special machine and dies.

←————Key Table No. 1————→←————Key Table No. 2————→←————Key Table No. 3————→

For Other Half Pattern Repeat 12-11-10-9-8-7-6-5-4-3-2-1.

By R. P. Harris

Round Elbows—Conversion Tables—Tenth Inches

38

THIS article presents a method and data for accurately projecting patterns for round pipe elbows, of any required diameter, inside throat radius, or any number of sections as provided by key tables.

In explanation, a two-piece elbow can be made by use of a mitre box, cutting a straight length of pipe at an angle, say 45 degrees to make a 90-degree two-piece elbow. The cut ends are reversed resulting in the longitudinal seams being at top and bottom of each section respectively.

In the case of a 10-inch diameter round pipe, the mitred section will be found to be from—

-0- at finish of straight pipe, inside at bottom, to 10 inches (or 100 Tenth inches) at extreme projection or top of pipe elbow, as shown in Fig. 1.

The in-between or centre line of pipe in both cases is 5 inches—or midway between extremes in measurements 0 to 100 (10 inches). It will be seen that the mitred edge when the pattern is stretched out in the flat results in a curved line which is the part of the pattern that counts. This line does not vary with the increase or decrease in the inside radius of the elbow. The more straight pipe added between the mitred or curved line, the greater the inside radius of the elbow. The straight pipe in the case of a two-piece and the various radius inside the throat in the case of a three or more section elbow, is only additional straight pipe sections added to the original curve -0- to extreme of elbow pattern.

Data and Key Tables

These are based on 10-inch diameter round piping and no allowances have been made for seams or edges, all calculations being for butted, welded joints. The projection figures in the tables are for every 24th part of the circumference or stretch-out.

-0- is equal to the inside bottom of the mitre and the largest figure equals the extreme of the projection or mitre at the top of the elbow, the figures being repeated in reverse to complete the full pattern back to -0-.

All figures given are in tenth inches, 10 inches equalling 100, and quarters equalling fortieth of an inch. The use of a paper scale rule in tenth Inches is essential.

As stated before, the key tables are based on 10-inch diameter pipe and to convert to any other required diameter is only a matter of proportion. In the aforementioned example of a two-piece elbow, (shown in Fig. 1) 90 degree, 10-inch diameter, the smallest projection commenced at -0- the center of side, 50 (tenths), the top or extreme 100 (tenths). To convert key figures for 5-inch diameter pipe, it is necessary to divide the key figures in table by 10 and multiply by 5 (required diameter) which would give the proportionate correct figures as, -0- (Bottom) = 25 (Tenths) or $2\frac{1}{2}$ in.: Centre, 50, or 5 in. Top or extreme

To avoid tiresome proportion sums, the Con-

Round Elbows—Conversion Tables—Tenth Inches

Dia.	19 ³ / ₄	20	20 ¹ / ₂	20 ³ / ₄	23	25	25 ¹ / ₄	26	26 ¹ / ₂	27	29	31 ¹ / ₄	35	35 ¹ / ₂	36 ¹ / ₂	38 ¹ / ₂	40 ³ / ₄	41 ¹ / ₂	42	43	43 ¹ / ₂	48	49 ¹ / ₂	50	54	57	58	63	75	85	93	99	100	
1 In.	2	2	2	2	2 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₂	2 ³ / ₄	3	3	3 ¹ / ₂	3 ¹ / ₂	3 ³ / ₄	3 ³ / ₄	4	4	4 ¹ / ₄	4 ¹ / ₄	4 ¹ / ₄	4 ³ / ₄	5	5	5 ¹ / ₂	5 ³ / ₄	5 ³ / ₄	6 ¹ / ₄	7 ¹ / ₂	8 ¹ / ₂	9 ¹ / ₄	10	10	
2	4	4	4	4	4 ¹ / ₂	5	5	5 ¹ / ₄	5 ¹ / ₄	5 ¹ / ₂	5 ³ / ₄	6 ¹ / ₄	7	7	7 ¹ / ₄	7 ¹ / ₂	8	8 ¹ / ₄	8 ¹ / ₂	8 ¹ / ₂	8 ³ / ₄	9 ¹ / ₄	10	10	10 ³ / ₄	11 ¹ / ₂	11 ¹ / ₄	12 ¹ / ₄	15	17	18 ¹ / ₂	19 ³ / ₄	20	
3	6	6	6	6	6 ¹ / ₄	7	7 ¹ / ₂	7 ¹ / ₂	7 ³ / ₄	8	8	8 ³ / ₄	9 ¹ / ₄	10 ¹ / ₂	10 ¹ / ₂	11	11 ¹ / ₂	12 ¹ / ₄	12 ¹ / ₂	12 ³ / ₄	13	13	14 ¹ / ₂	14 ³ / ₄	15	16 ¹ / ₄	17	17 ¹ / ₂	19	22 ¹ / ₂	25 ¹ / ₂	28	29 ³ / ₄	30
4	8	8	8	8	8 ¹ / ₄	9 ¹ / ₄	10	10	10 ¹ / ₂	10 ³ / ₄	10 ³ / ₄	11 ¹ / ₂	12 ¹ / ₂	14	14 ¹ / ₄	14 ¹ / ₂	15 ¹ / ₄	16 ¹ / ₄	16 ¹ / ₂	16 ³ / ₄	17 ¹ / ₄	17 ¹ / ₄	19 ¹ / ₄	19 ³ / ₄	20	21 ¹ / ₂	22 ³ / ₄	23 ¹ / ₂	25 ¹ / ₄	30	34	37 ¹ / ₄	39 ¹ / ₂	40
5	10	10	10 ¹ / ₄	10 ³ / ₄	11 ¹ / ₂	12 ¹ / ₂	12 ¹ / ₂	13	13 ¹ / ₄	13 ¹ / ₂	14 ¹ / ₂	15 ¹ / ₂	17 ¹ / ₂	17 ³ / ₄	18 ¹ / ₄	19 ¹ / ₄	20 ¹ / ₄	20 ³ / ₄	21	21 ¹ / ₂	21 ³ / ₄	24	24 ¹ / ₄	25	27	28 ¹ / ₂	29	26 ¹ / ₂	37 ¹ / ₂	42 ¹ / ₂	46 ¹ / ₂	49 ¹ / ₂	50	
6	12	12	12 ¹ / ₄	12 ¹ / ₂	13 ³ / ₄	15	15	15 ¹ / ₂	16	16 ¹ / ₄	17 ¹ / ₂	18 ³ / ₄	21	21 ¹ / ₄	22	23	24 ¹ / ₂	25	25 ¹ / ₄	25 ³ / ₄	26	28 ³ / ₄	28 ³ / ₄	30	32 ¹ / ₂	34 ¹ / ₄	34 ³ / ₄	37 ³ / ₄	45	51	56	59 ¹ / ₂	60	
7	14	14	14 ¹ / ₄	14 ¹ / ₂	16	17 ¹ / ₂	17 ³ / ₄	18 ¹ / ₄	18 ¹ / ₂	19	20 ¹ / ₄	21 ¹ / ₄	24 ¹ / ₂	24 ³ / ₄	25 ¹ / ₂	27	28 ¹ / ₂	29	29 ¹ / ₂	30	30 ¹ / ₂	33 ³ / ₄	34 ³ / ₄	35	37 ³ / ₄	40	40 ¹ / ₂	44	52 ¹ / ₂	59 ¹ / ₂	65	69 ¹ / ₄	70	
8	16	16	16 ¹ / ₄	16 ³ / ₄	18 ¹ / ₂	20	20 ¹ / ₄	20 ³ / ₄	21 ¹ / ₄	21 ¹ / ₂	23 ¹ / ₄	25	28	28 ¹ / ₄	29 ¹ / ₄	30 ³ / ₄	32 ¹ / ₂	33 ¹ / ₄	33 ³ / ₄	34 ¹ / ₄	34 ¹ / ₄	38 ¹ / ₂	39 ¹ / ₂	40	43 ¹ / ₄	45 ³ / ₄	46 ¹ / ₂	50 ¹ / ₂	60	68	74 ¹ / ₂	79 ¹ / ₄	80	
9	17 ³ / ₄	18	18 ¹ / ₂	18 ³ / ₄	20 ³ / ₄	22 ¹ / ₂	22 ³ / ₄	23 ¹ / ₂	23 ³ / ₄	24 ¹ / ₄	26	28	31 ¹ / ₂	32	32 ³ / ₄	34 ³ / ₄	36 ³ / ₄	37 ¹ / ₄	37 ³ / ₄	38 ³ / ₄	39	43 ¹ / ₄	44 ¹ / ₂	45	48 ³ / ₄	51 ¹ / ₄	52 ¹ / ₄	56 ³ / ₄	67 ¹ / ₂	76 ¹ / ₂	83 ³ / ₄	89	90	
10	19 ³ / ₄	20	20 ¹ / ₂	20 ³ / ₄	23	25	25 ¹ / ₄	26	26 ¹ / ₂	27	29	31 ¹ / ₄	35	35 ¹ / ₂	36 ¹ / ₂	38 ¹ / ₂	40 ³ / ₄	41 ¹ / ₂	42	43	43 ¹ / ₂	48	49 ¹ / ₂	50	54	57	58	63	75	85	93	99	100	
11	21 ³ / ₄	22	22 ¹ / ₂	23	25 ¹ / ₄	27 ¹ / ₂	27 ³ / ₄	28 ¹ / ₂	29	29 ³ / ₄	32	34 ¹ / ₄	38 ¹ / ₂	39	40 ¹ / ₄	42 ¹ / ₄	44 ³ / ₄	45 ¹ / ₂	46 ¹ / ₄	47 ¹ / ₄	47 ³ / ₄	52 ³ / ₄	54 ¹ / ₂	55	59 ¹ / ₂	62 ³ / ₄	63 ³ / ₄	69 ¹ / ₄	82 ¹ / ₂	93 ¹ / ₂	102 ¹ / ₄	109	110	
12	23 ³ / ₄	24	24 ¹ / ₂	25	27 ¹ / ₂	30	30 ¹ / ₄	31 ¹ / ₄	31 ³ / ₄	32 ¹ / ₂	34 ³ / ₄	37 ¹ / ₂	42	42 ¹ / ₂	43 ¹ / ₄	46	48 ³ / ₄	49 ³ / ₄	50 ¹ / ₂	51 ¹ / ₂	52 ¹ / ₄	57 ¹ / ₂	59 ¹ / ₂	60	64 ³ / ₄	68 ¹ / ₂	69 ¹ / ₂	75 ³ / ₄	90	102	111 ³ / ₄	118 ³ / ₄	120	
13	25 ³ / ₄	26	26 ¹ / ₂	27	30	32 ¹ / ₂	32 ³ / ₄	33 ³ / ₄	34 ¹ / ₂	35	37 ³ / ₄	40 ¹ / ₂	45 ¹ / ₂	46	47 ¹ / ₂	50	53	54	54 ³ / ₄	56	56 ¹ / ₂	62 ¹ / ₂	64 ¹ / ₄	65	70 ¹ / ₄	74 ¹ / ₄	75 ¹ / ₂	82	97 ¹ / ₂	110 ¹ / ₂	121	128 ³ / ₄	130	
14	27 ³ / ₄	28	28 ³ / ₄	29	32 ¹ / ₄	35	35 ¹ / ₄	36 ¹ / ₂	37 ¹ / ₄	37 ³ / ₄	40 ¹ / ₄	43 ³ / ₄	49	49 ³ / ₄	51	53 ³ / ₄	57	58	58 ³ / ₄	60 ¹ / ₄	60 ³ / ₄	67 ¹ / ₄	69 ¹ / ₄	70	75 ³ / ₄	80	81 ¹ / ₄	88 ³ / ₄	105	119	130 ³ / ₄	138 ³ / ₄	140	
15	29 ³ / ₄	30	30 ³ / ₄	31	34 ¹ / ₂	37 ¹ / ₂	37 ³ / ₄	39	39 ³ / ₄	40 ¹ / ₂	43 ¹ / ₂	46 ³ / ₄	52 ¹ / ₂	53 ¹ / ₄	54 ³ / ₄	57 ³ / ₄	61	62 ¹ / ₄	63	64 ¹ / ₂	65 ¹ / ₄	72	74 ¹ / ₄	75	81	85 ¹ / ₂	87	94 ¹ / ₂	112 ¹ / ₂	127 ¹ / ₂	139 ¹ / ₂	148 ¹ / ₂	150	
16	31 ³ / ₄	32	32 ³ / ₄	33 ³ / ₄	37	40	40 ¹ / ₂	41 ¹ / ₂	42 ¹ / ₂	43 ¹ / ₄	46 ¹ / ₂	50	56	56 ³ / ₄	58 ¹ / ₂	61 ¹ / ₂	65 ¹ / ₄	66 ¹ / ₂	67 ¹ / ₄	68 ³ / ₄	69 ¹ / ₂	76 ³ / ₄	79 ¹ / ₄	80	86 ¹ / ₂	91 ¹ / ₄	92 ³ / ₄	101	120	136	148 ³ / ₄	158 ³ / ₄	160	
17	33 ³ / ₄	34	34 ³ / ₄	35 ³ / ₄	39 ³ / ₄	42 ¹ / ₂	43	44 ¹ / ₄	45	46	49 ¹ / ₄	53	59 ¹ / ₂	60 ¹ / ₄	62	65 ¹ / ₂	69 ¹ / ₄	70 ¹ / ₂	71 ¹ / ₂	73	74	81 ¹ / ₄	84 ¹ / ₄	85	91 ³ / ₄	97	98 ¹ / ₂	107	127 ¹ / ₂	144 ¹ / ₂	158	168 ³ / ₄	170	
18	35 ³ / ₄	36	36 ³ / ₄	37 ³ / ₄	41 ¹ / ₂	45	45 ¹ / ₂	46 ³ / ₄	47 ³ / ₄	48 ¹ / ₂	52 ¹ / ₄	56 ¹ / ₄	63	63 ³ / ₄	65 ³ / ₄	69 ¹ / ₄	73 ¹ / ₄	74 ¹ / ₄	75 ³ / ₄	77 ³ / ₄	78 ¹ / ₄	86 ³ / ₄	89	90	97 ¹ / ₄	102 ¹ / ₂	104 ¹ / ₂	113 ¹ / ₂	135	153	167 ¹ / ₄	178 ¹ / ₄	180	
19	37 ³ / ₄	38	39	39 ¹ / ₂	43 ³ / ₄	47 ¹ / ₄	48	49 ¹ / ₂	50 ¹ / ₄	51 ¹ / ₄	55	59 ¹ / ₄	66 ¹ / ₂	67 ¹ / ₂	69 ¹ / ₄	73 ¹ / ₄	77 ¹ / ₂	78 ³ / ₄	79 ³ / ₄	81 ³ / ₄	82 ¹ / ₂	91 ¹ / ₄	94	95	102 ³ / ₄	108 ¹ / ₄	110 ³ / ₄	119 ³ / ₄	142 ¹ / ₂	161 ¹ / ₂	176 ³ / ₄	188	190	
20	39 ¹ / ₂	40	41	41 ¹ / ₂	46	50	50 ¹ / ₂	52	53	54	58	62 ¹ / ₂	70	71	73	77	81 ¹ / ₂	83	84	86	87	96	99	100	108	114	116	126	150	170	186	198	200	
Add For																																		
¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	¹ / ₈	³ / ₄	³ / ₄	³ / ₄	³ / ₄	³ / ₄	³ / ₄	³ / ₄	³ / ₄	1	1	1	1 ¹ / ₄	1 ³ / ₄
¹ / ₄	¹ / ₄	¹ / ₄	¹ / ₄	¹ / ₄	¹ / ₄	¹ / ₄	¹ / ₄	³ / ₄	³ / ₄	³ / ₄	³ / ₄	³ / ₄	³ / ₄	³ / ₄	³ / ₄	³ / ₄	³ / ₄	1	1	1	1	1	1 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₂	1 ¹ / ₂	1 ¹ / ₂	1 ¹ / ₂	2	2	2 ¹ / ₄	2 ¹ / ₂	2 ¹ / ₂
³ / ₈	³ / ₈	³ / ₈	³ / ₈	³ / ₈	³ / ₈	1	1	1	1	1	1	1	1 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₂	1 ¹ / ₂	1 ³ / ₄	1 ³ / ₄	1 ³ / ₄	1 ³ / ₄	1 ³ / ₄	2	2	2	2 ¹ / ₄	2 ¹ / ₄	2 ¹ / ₄	2 ¹ / ₄	2 ³ / ₄	3 ¹ / ₄	3 ¹ / ₂	3 ³ / ₄	3 ³ / ₄
¹ / ₂	1	1	1	1	1 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₂	1 ¹ / ₂	1 ³ / ₄	1 ³ / ₄	1 ³ / ₄	1 ³ / ₄	2	2	2	2 ¹ / ₄	2 ¹ / ₄	2 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₂	2 ³ / ₄	2 ³ / ₄	3	3					

version Tables, which contain all numbers required to be converted in conjunction with key tables, will be found to easily give the required substituted figures.

Procedure

Having selected the angle, diameter, radius and number of sections or pieces for round pipe required, write out on a piece of paper the appropriate key table for 10-Inch diameter.

Next substitute the key table figures for required diameter by use of conversion tables. In this case it is only necessary to use key tables for top quarter of pattern, Nos. 1 to 7, that is from the greatest figure to half-way or centre of side.

The rest can be obtained easily by subtraction thus:

Nos. 1 to 6, as Key Tables converted.

No. 7, Centre of side, or Half of No. 1.

Then by subtraction,

No. 8, Subtract No. 6 from No. 1. Equals figure required.
No. 9, Subtract No. 5 from No. 1. Equals figure required.
No. 10, Subtract No. 4 from No. 1. Equals figure required.
No. 11, Subtract No. 3 from No. 1. Equals figure required.
No. 12, Subtract No. 2 from No. 1. Equals figure required.
No. 13, Subtract No. 1 from No. 1. Equals -0-.

The radius key tables refer to **inside radius** required at throat and are based on 10-inch diameter **radius** (Not Pipe) and are taken at the first section, a three-piece elbow being referred to as 22½ degree mitre, first section. The key figures are converted to radius required and have no relation to diameter of pipe.

Example by Wm. Neubecker

So that the various steps will be understood in using the various Key and Conversion Tables shown herewith, an example will be given showing how the various true dimensions will be found. Let us assume that the various dimensions are desired for a four-piece, 60-deg. elbow, 8 inches in diameter with a 7-inch radius as shown in Fig. 2.

The first step is to lay off the *semi-circumference* of an 8-inch circle and divide this or any other semi-circumference always in 12 equal divisions as shown from 1 to 13 in Fig. 3. As the four-piece elbow will have an angle of 60 deg. when completed, refer to Key Table No. 1, 60 deg. angle, 4-piece column, which gives 17½ when intersected by the top line marked 1. Now follow the *upper line* of the Conversion Tables to 17½. Follow this column down until it is intersected by the number 8 in the diameter column (left hand col.) at 14 or 14 tenths = 1 4/10 inches. This 1 4/10 inch is the projection on line 1 in the pattern shown in Fig. 3 and is the starting point of the miter cut.

To obtain the key numbers for the projections of the pattern lines 2-3-4-5-6 and 7 in Fig. 3, again refer to Key Table No. 1 and where the numbers 2 to 7 in the first column intersect the 4 piece column of 60 deg. angle as shown respectively by the numbers 17¼, 16½, 15, 13¼, 11 and 8¾, will be the required keys.

Now refer to similar numbers in the Conversion Tables on the *upper line* and intersect them by the number 8 in the inch column as indicated by the bold face numbers 13¾, 13¼, 12, 10½, 8¾ and 7 all

tenths of an inch, being careful to use a rule on which the inch is divided in 10 parts as shown above Fig. 1.

These measurements are now placed on lines 2 to 7 in the pattern in Fig. 3 as shown. The same procedure would be required to find the projections of lines marked 8 to 13 in the half pattern shape. Follow the numbers in Key Table No. 1, from 8 to 13 to intersect the 4-piece column on the 60 deg. angle. Then compare these numbers with similar number on the *first line* of the Conversion tables and intersect the various columns containing these numbers by the number 8 in the inch column as before. If desired, the Key and Conversion tables can be omitted in obtaining the correct projection for lines 8 to 13, in the pattern shape, by using the method which follows.

Referring to the semi-pattern in Fig. 3 the true projections for lines 1 to 7 inclusive are as follows:

No. 1—14 tenths.

No. 2—13¾ tenths.

No. 3—13¼ tenths.

No. 4—12 tenths.

No. 5—10½ tenths.

No. 6—8¾ tenths.

No. 7—7 tenths.

To obtain the true projections for lines 8 to 13 inclusive

Deduct No. 6 from No. 1 = 5¼ tenths for No. 8.
Deduct No. 5 from No. 1 = 3½ tenths for No. 9.
Deduct No. 4 from No. 1 = 2 tenths for No. 10.
Deduct No. 3 from No. 1 = ¾ tenths for No. 11.
Deduct No. 2 from No. 1 = ¼ tenths for No. 12.
Deduct No. 1 from No. 1 = 0 tenths for No. 13.

Through these points of intersections in Fig. 3 the miter line is drawn as shown from *a* to 13. As this 4-piece, 60 deg. elbow of 8-inch diameter is to have a seven inch throat radius and as each miter line has an angle of 10 deg. because a 4-piece elbow will count 6, one for each end and two for each center piece, or 60

— = 10 deg.

6

Now refer to the Throat Radius in Key Table No. 3. Follow down the degree column to 10 deg. and obtain the Key number 18 at the right. Take 18 to the Conversion Table on the *first line*, follow down this column to intersect the No. 7 line in the inch column at 12½

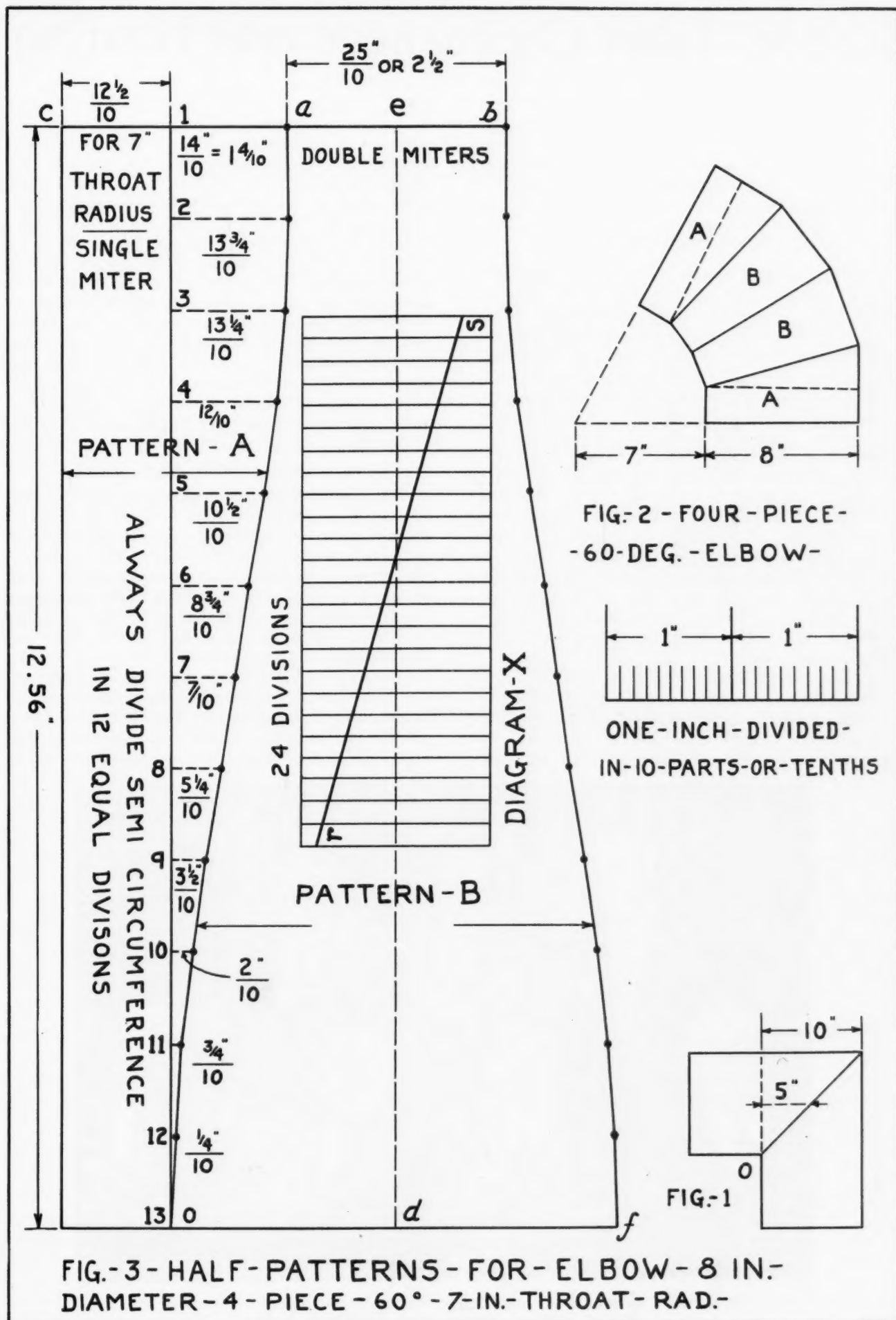
12½
which equals — as shown at the left of the line 1—13
10

in the half pattern in Fig. 3 and represents the amount of straight pipe to be added to the single miter as shown by the dotted line in A and A in Fig. 2. For the double miter or the middle pieces B and B, simply make the distance from *a* to *b* in the half pattern in

2 × 12½ 25
Fig. 3 equal to — = — or 2½ inches.
10 10

Now take the distance from *a* to *c* and set it off from 0 to *d* and draw the center line *d-e*.

Take a tracing or template of *e-a-0-d* and reverse it as shown by *e-b-f-d* to complete the one-half net pattern for pieces B and B in Fig. 2. Two of pattern A and two of pattern B in Fig. 3 will be required to complete the 4 piece, 8 in., 60 deg. elbow with 7-in. throat radius.



Illinois Talks Ordinances and Heating

THE Sheet Metal Contractors Association of Illinois, holding the second convention since the revival of the organization, met January 18 and 19 in Peoria with a very encouraging attendance of contractors, manufacturers and manufacturers' representatives.

Codes and Ordinances

J. D. Wilder, Chicago, opening the legislative session discussed the general aspects of codes and ordinances now in force in various states and individual cities and analyzed some of these ordinances, pointing out that of all the ordinances scrutinized in the last year it has been found that most ordinances cover the construction of chimneys and flues, installation of smoke pipes into chimneys, insulation of smoke pipes and hot pipes near exposed wood work. That approximately one-half of the codes studied cover the subject of gravity furnace installation by adapting therein the Standard Gravity Code. The speaker pointed out, however, that so far as mechanical warm air heating is concerned, 90 percent of the existing codes and licenses absolutely ignore mechanical heating. He pointed out that the experience of various cities indicate that no licensing agreement or any heating code is any better than the inspection service coupled to the code.

J. E. Peterson, Hinsdale, who was one of the active sponsors of the Illinois state code submitted to the legislature last year analyzed and discussed the provisions contained in that proposed bill, and explained the steps whereby the bill had been

taken to final reading and was then tabled due to adjournment. Under the bill, as explained by Mr. Peterson, a definition is established of a warm air heating contractor, covers the maintenance, installation, correction of all types of warm air heating systems; any contractor already in business continues in business automatically, but future contractors must take an examination. Most of the provisions were fairly general, since it was the intention of the sponsors to eliminate all regulations which would require future legislation to make any changes in the original bill. Mr. Peterson declared that he believed municipal and state codes or ordinances should be complementary, and the association should sponsor this state code with the various individuals attending the convention sponsoring local ordinances complementary to the state code.

Favorable and Unfavorable Legislation

E. C. Carter of Chicago, discussing various forms of legislation definitely harmful to our industry, declared that both local and state associations must actively watch two distinct types of legislation. The first is the legislation sponsored by our own industry to see that such legislation secures proper recognition. The second type of legislation is that which is definitely aimed against our industry. An example is the Illinois sales tax where seven distinct rulings had been given by different men until finally one favorable to our industry was secured. Mr. Carter declared that every association should have an active legislative committee because under present governmental operations practically



Seated—Vice-President Lauerman, President Walter, Secretary Poe, Treasurer Eynatten. Standing—Director Peterson, Director Johns, Ex-Director Radtke.

all laws are enforced by rulings of individuals or department heads rather than by actual written law.

State Representative Reed F. Cutler of the 43rd Illinois District, pointing out the ways and means whereby the desired legislation can be properly introduced and passage secured, declared that no one group can just present a bill which they desire and expect such a bill to be passed without due investigation and discussion on the part of the State Legislature. According to Representative Cutler, the trend in the legislature today is definitely against all regulation, particularly regulation of industry, but there is still an opening for legislation which definitely protects the public against a definite health or fire hazard or against improper business practices. The second general requirement is that any piece of legislation must be definitely worthwhile. Most members of the legislature are glad to vote for bills which constituents definitely want and the proper procedure would be for each of the state association members to discuss the bill with his state representative and explain its ramifications and regulations.

Forced Air Heating

Under the general title of "Past, Present and Future of Forced Air Heating," R. P. Whitmer, Bloomington, bell-weathered the session devoted to modern and future types of heating. As to the past, Mr. Whitmer related that on vacation trips to Mexico and Central America he has found proof that very excellent sheet metal work was done in those areas prior to 1540. As to the present, Mr. Whitmer declared that contractors must answer the question "should they continue in business for themselves or work for someone else," and if they are going to continue in business, do they expect to study advances made in heating, sheet metal, air conditioning and ventilation or will they be content to continue along the same lines as heretofore and shall the contractor be content to subcontract work for others who take the profits from apparatus or will the contractor decide that the profit which lies in apparatus is a desirable profit.

As to the future of design, Mr. Whitmer declared that there are too many contractors who do not understand or use the various codes set up as desirable standards. Furthermore, many contractors can not follow such codes as they do not understand the regulations contained. Many manufacturers have their own codes and these differ radically from the standard codes of the industry. The contractor either must be able to understand all codes or be able to adopt the code he operates under to the specifications laid down by architects and builders.

Gas Heating

Introducing gas in heating into the automatic heating picture, J. G. Farnsworth of Peoria, declared that the principal objective of any utility is to sell gas or electricity.

Mr. Farnsworth declared that the Central Illinois Power & Light Company has for the past several

years been operating under a plan which seems to be entirely satisfactory to the utility and to the contractors and this plan is based upon these fundamental principles:

1. The Utility sells no equipment.
2. The Utility urges equipment manufacturers to extend to dealers discounts equal to those extended to utilities.
3. The Utility has agreed to assist all dealers in the sale of gas equipment.
4. The advent of natural or mixed gas in the territory served has reduced the utility income by approximately one-half, so the utility has turned to the sale of large numbers of conversion burners as a load builder.
5. Five salesmen are on the street all the time selling gas heating equipment on a small salary and commission, the installations are made by the contractor, and the equipment is billed through the contractor so that the contractor secures the equipment profit.
6. When the contractor sells the furnace or equipment, he gets approximately ten per cent additional profit.
7. The Utility has definitely stated that there will be no bid peddling or peddling of prospects or gratuities extended to any one or group of contractors.

As a result of this program, over 80 per cent of all jobs sold in the territory served are warm air heated and this percentage is increasing monthly. While conversion burners are being pushed as load builders it is the judgment of the Utility that eventually these conversion burners will be replaced by straight gas furnaces because of greater efficiency and economy and better operating characteristics.

Stoker Firing

K. C. Richmond, Chicago, "What's Going On in the Stoker Industry," declared that the stoker industry in 1938 sold more stokers than in any one preceding year. He gave as a chief reason for this increased sale the growing demand for comfort during the winter months. Mr. Richmond cited permits for automatic firing devices in Cincinnati, Nashville, Denver, Omaha, St. Louis and Chicago, in most of these cities stoker sales showing increases for 1938 over 1937 as compared with decreases in sales percentages for other types of firing devices.

Mr. Richmond declared that figures compiled for 1938 show definitely that stokers are being purchased by individuals of relatively low income. In the city of Chicago, 1938 figures show that stokers were purchased by families having an average monthly income of \$173.00. If executives and business men enjoying a larger than average income are omitted from this Chicago list, the average income of stoker purchasers would equal \$151.00 a month.

Figures for the entire country show that it makes practically no difference whether the town is large or small so far as stoker sales per capita are concerned; many small towns show a better average

sale figure than larger cities. The basic reasons for stoker popularity can be found in the fact that stokers offer comfort at low cost, convenience without too much work, and economy and comfort without using a luxury fuel. Two interesting developments during 1938 were the increasing percentage of bin-feed type sold and the increased percentage of sales for anthracite stokers.

That the warm air heating and sheet metal contractor has a logical place in the stoker sale picture is indicated, in Mr. Richmond's opinion, by the fact that in the potential market for the sale of four and a half million household stokers, many of these units will be placed in houses more than thirty years old where the heating plant also needs replacement. Where this is the case, the warm

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air heating contractor stands the best chance to sell the complete furnace and automatic firing device.

Oil Burners

L. I. Aldrich, Peoria, speaking on the oil burner market declared that the popularity of any particular type of fuel depends upon the cost of the fuel. He stated that people undoubtedly want automatic firing, but very naturally turn to the lowest cost fuel first and the cost of the fuel therefore determines to a large degree which type of firing device is most popular. Mr. Aldrich pointed out that the average home owner will take a very high depreciation on a new automobile and will complain bitterly over a \$50 extra cost of fuel for an entire heating

season. An interesting development in 1938, declared Mr. Aldrich, was the introduction of an oil burner to use No. 5 fuel, which sells for 2½¢ to 3½¢ per gallon. Contrary to many popular opinions, there is still available a very plentiful supply of oil; oil may go up in price, but any shortage of oil will not occur in the lifetime of the present generation. That oil burners are admirably suited to the present day demands for a minimum range in inside temperatures is indicated by the fact that a conversion oil burner placed in a good warm air heating furnace and properly controlled can maintain temperatures within a range of 1½ degree. One reason for oil-burner popularity, declared the speaker, is that in many areas some heat is required during approximately 11 months of the year and only an intermittent firing device like an oil burner can satisfactorily supply a small amount of heat for a brief period in the fall or spring.

Mr. Aldrich said he would like to take the opportunity to point out one trend which in his estimation is somewhat dangerous. That trend is the introduction of furnaces and boilers with restricted combustion chambers.

Controls

C. W. Nessel, Dayton, Ohio, speaking on controls outlined some of the early control instruments and the developments from the time of the first thermostat, spring wound, damper motor combination up to the present complicated zone-distribution control system which is in actuality a true "temperature watchman." After the spring wound damper motor which sold for \$125 to \$200 installed, the second step was the addition of a limit control and the third step was the clock-type thermostat. Mr. Nessel went on to describe some of the more complicated instruments and control assemblies which are available today. Some of the problems which remain to be solved are simpler control systems and instruments for cooling systems and the perfection of some types of water valves which are not affected by hard water.

Welding

C. G. Bassler, Chicago, speaking on resistance welding, outlined the four basic types of resistance welders as the spot welder, the projection welder, the flash butt welder and the flash seam welder. Successful resistance welding depends, it was explained, upon accurate control and proper selection of the amount of current and the pressure applied—in other words, heat and squeeze. A third fundamental which is only now being given its proper consideration is timing, the length of time during which the current is "on." The speaker showed samples of several materials welded together with different types of welds, using different weights of materials and samples of two pieces of galvanized iron welded together in which the entire galvanized coating was not destroyed. To accompany his talk, a film showing resistance welding apparatus used in an automobile body plant was shown.

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Where Are We Heading?

By B. F. McLouth

Chairman, Technical Code Committee,
Nat'l Warm Air Htg. & Air Conditioning Ass'n

THE question "where are we heading" is foremost in the minds of many who have grown up with this residential heating and air conditioning industry.

Perhaps the uncertainty can be traced to the "growing pains" of a new and coming industry. A brief review the past ten years may throw some light on the problem.

Some Pioneering History

A great many men who helped to usher in mechanical air circulation undoubtedly feel that Jimmy Miles with his talks at the National Warm Air Heating and Air Conditioning Association meetings, first focused attention on this new idea and "fathered" forced warm air heating. Of course lots of old timers frowned at his ideas and attempted to throw cold water on his suggestions. Nevertheless, he was largely responsible for the initial pioneering effort.

Following Jimmy Miles' pioneering many new faces and names appeared in the warm air field. A few blower manufacturers saw a potential market and entered enthusiastically with the furnace blower. Some few thought they saw possibilities in imitating large industrial air washers with small washers for home installations. Still others saw the need of new controls. These advancements stirred the register and grille industry into action, and they produced more modern and up-to-date registers.

Following closely on the footsteps of the air washer came the advent of the throw away type of filters and the automatic humidifier.

Over night it seemed a new industry was born—residential air conditioning.

Along Came the Depression

Then came the depression. To many the depression came as an "unwelcome" blessing. Many old line manufacturers had entered into the field blindly, and the depression forced them to proceed slowly, giving them the opportunity to "time test" their products, before entering large scale production. Many a "neck" was saved in this manner as errors were discovered before a damaging number of unsatisfactory installations were made.

During the depression many advancements were made within the industry proper. These improvements included adapting old established heating units to new package units, consisting of furnace, blower, filters and humidifier in a single casing. By contrast, the development of new and more radical

heating elements with more heating surface, longer flue travel, compact, attractive casings were left mostly to new comers just entering the field. Of course it is unfair to say the older manufacturers were not justified in attempting to adapt their existing equipment to the newer purpose. They had felt the depression and were reluctant to invest heavily until better times were in sight.

About four years ago, business took a definite turn upward. A new building boom got under way. Everyone was optimistic. Why worry about new competitors? There was enough business for all. For a short time it seemed so. But right in the shadow of the first good year since 1929 came the second depression. Building was cut in half and established manufacturers, along with all the new neighbors, had surplus stock and new, modernized manufacturing facilities. The inevitable happened: price cutting, and a mad scramble never experienced before. In this scramble the inroads of the "new neighbors" became evident to many for the first time.

How was it possible for these newcomers to gain such a quick and substantial foothold. First, a fine job of advertising, making the public air conditioned minded. Their "million dollar" advertising campaigns made a magic word of "air conditioning." However, some of this advertising carried a tremendous "kickback."

Public Expects the Impossible

Today, Mr. Average Public (after reading some of this advertising) has gained the opinion that "Florida breezes," "a day in June," or a "South Sea atmosphere" is as possible and logical as his daily trip to town in his trusty auto. He feels that controlling the indoor weather to meet his every desire is just a matter of turning a dial or snapping a switch, as commonplace as stepping on the throttle or brake of an automobile.

The public does not realize the intangible factors and variables to be dealt with in attempting to control the physical comforts of a human being. Five years ago a customer was satisfied if the heating plant would control the temperature to a nominal difference of four to five degrees. Today this same owner may object to two degrees difference or even a one-degree variation. This, of course, is a result of improper advertising.

Second, these newcomers launched a merchandising campaign unprecedented in the comparatively easy-going furnace industry. High pressure salesmen (trained in other lines) were sketchily trained

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Spandrel Beam Waterproofing

Can Now be Returned to the Sheet Metal Contractor

IN architecture, the construction industry has long known, any change in materials or application usually necessitates additional changes in order to compensate for something lost in the first change. For example, when the thick, heavy walls of load bearing construction gave way to steel or concrete framing and thin curtain walls, trouble was experienced with water driving through the walls. Or, in older and heavier types of construction, water might take years to find channels through the thick walls, whereas, in today's thin walls, there are many spots quite vulnerable to water penetration.

One such spot is outside spandrel beams. In putting up a modern building it is extremely difficult to shut off all channels from outside to inside, as a result, water finds a channel through the outside material, fills the space between exterior and backup; may work on through the wall to the beam and inside, or, more dangerous, the water may fill the space between exterior and backup, freeze and cause the exterior to fall away.

Spandrel Beam Problems

Architects generally agree that spandrel waterproofing is necessary to modern construction. Many protective methods have been tried without complete success, among these being asphalt fabrics, felt membranes, wire mesh membranes, even paper-thin copper sheets covered with asphalt bitumens or building papers. Failure has been due to the disintegration of the materials themselves, the ease with which they puncture with rough handling and their inability to provide quick drainage of the moisture from the wall. In the case of thin copper, the copper does not disintegrate but the backup does and careless handling by masons may puncture the sheets.

Of equal importance to the sheet metal craft, all of these materials can and are applied by other tradesmen, leaving the sheet metal contractor completely out of this remunerative field.

Within the last few months a new and better waterproofing idea has been introduced—this idea placing waterproofing of spandrels in the sheet metal contract and thus giving new and increased work to our industry.

This new spandrel waterproofing idea is based upon an entirely new and different principle. The general plan is shown in the details. The plan and the materials were developed by the Cheney Co., manufacturers of flashing materials. Briefly, the plan is as follows:

Cheney copper flashing (16-oz.) or Three Way Flashing (10 oz.) is carried completely through the wall continuously around the entire building at the top of the spandrel beam as near as possible to the line of the finished floor. A special flashing reglet of 16-oz. copper is nailed to the forms so that a 45-degree slot is formed at the bottom of the concrete beam just above the top of the lintel angle extending six inches beyond each end of the opening below. During construction, after the lintel angle is in place, a piece of plain copper flashing bent as shown in the sketch is inserted full depth into the reglet, the upper surface of which is of saw-tooth design, thereby locking the flashing firmly into place.

The advantages are:

1. Simplicity of installation.
2. Copper is permanent and able to withstand abuse.
3. Provides weep hole drainage.
4. And most important: usually costs one-half of the usual membrane methods.

The general construction is plainly set out in the following specifications which may be used by the architect to obtain exactly the results desired.

SHEET METAL Specification

Furnish and install over all door and window openings in all concrete spandrels at a point not more than 1 inch above top of vertical leg of angle Cheney Flashing Reglet. This contractor shall attach the reglet to the concrete forms of spandrel beams at the time these are erected by others and shall co-operate with contractor for this work, installing reglet before forms are put into place. Reglet shall be attached to inside of wood forms with $\frac{3}{4}$ -inch special copper double head nails (furnished with reglet). Reglet shall extend 6 inches beyond each end of opening and shall be made of 16-ounce copper. Forty-five degree slot in reglet to be $1\frac{1}{4}$ inches deep and with $\frac{1}{4}$ -inch opening and the upper surface of slot to be of sawtooth design to provide self-locking means when copper counterflashing is inserted.

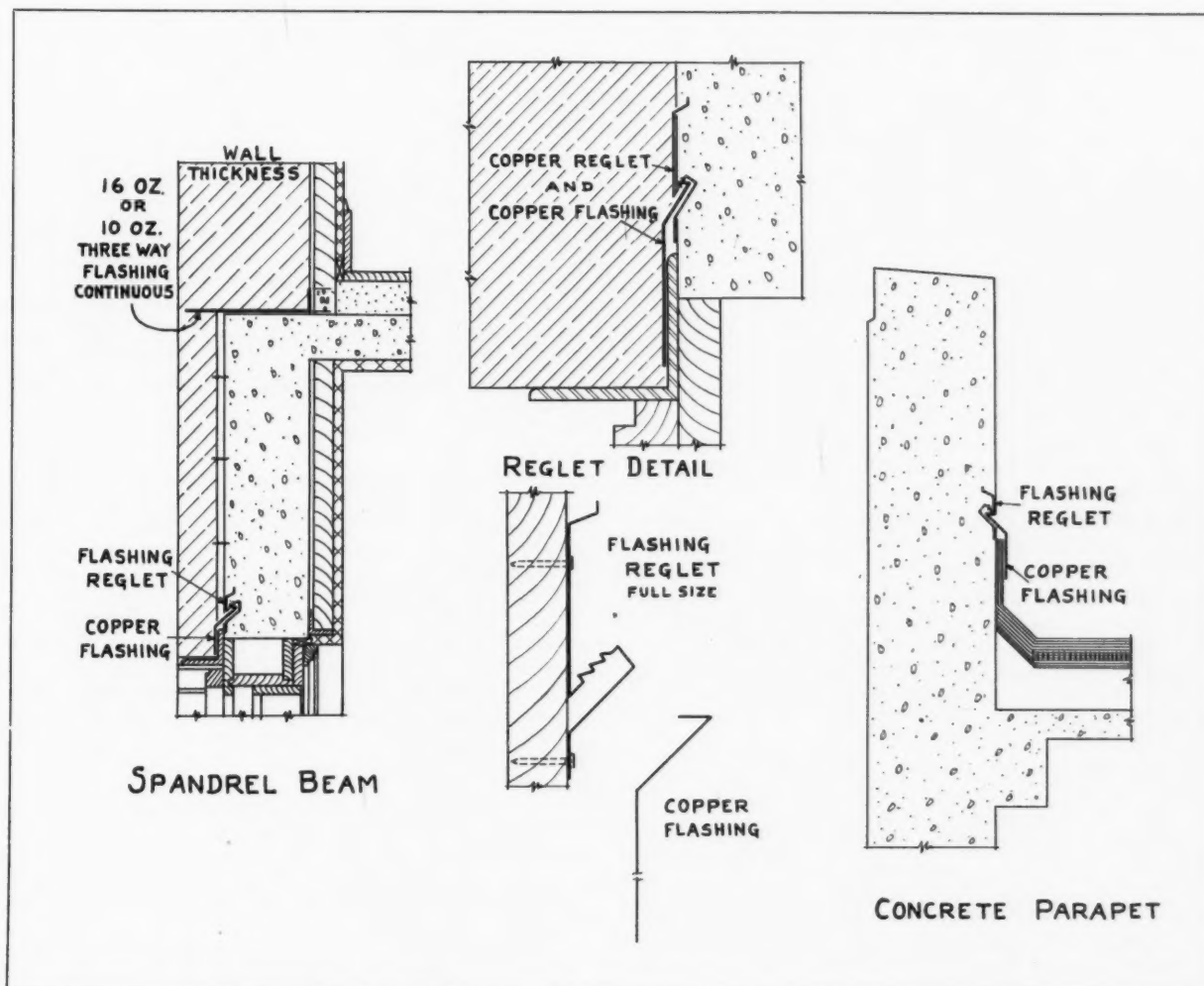
Furnish and install at all floor levels continuously around entire building a 16-ounce (or 10-ounce) thru-wall flashing. Flashings shall be formed into dovetail shaped flat corrugations or undercut sawtooth ribs, extending transversely of the sheet and not over 3 inches apart, which shall provide a mechanical keybond in the mortar bed in three directions, (longitudinally, transversely, and vertically). Crimped copper or deformed sheets which provide bond only in horizontal directions will not be accepted. The use of attached members, either riveted or soldered to the flashing sheets, will not be permitted, and the metal shall not be broken, drawn, stretched or perforated in any manner. The flashing shall be set in a bed of mortar and shall be shoved into place in a manner that will insure filling all deformations of the copper. Flashing shall turn up against

columns not less than 2 inches and be made watertight with plastic cement.

Flashing Reglet and through wall flashing shall be as manufactured by The Cheney Company, Architects Building, Philadelphia, Pa., Universal Flashing Company, Fairhaven, Mass., or Interlock Flashing Company, Long Island City, New York.

Furnish and lock into flashing reglet a 16-ounce copper counter-flashing lapping over vertical leg of angle not less than 2 inches. Counterflashing shall be formed with $\frac{3}{8}$ -inch lip that self-locks into the flashing reglet and extends

let. This contractor shall attach flashing reglet to the concrete forms at the time these are erected by others and shall co-operate with the contractor for this work, installing reglet before forms are put in place. Reglet shall be attached to inside of wood forms with $\frac{3}{4}$ -inch special copper double head nails (furnished with reglet). Reglet shall be made of 16-ounce copper with a 45-degree slot in reglet to be $1\frac{1}{8}$ inches deep and with $\frac{1}{4}$ -inch opening and the upper surface of slot to be of sawtooth design to provide self-locking means when copper counterflashing is inserted.



4 inches beyond each end of all exterior door and window openings.

Concrete

All exterior door and window openings in all concrete spandrel beams are to be provided with Cheney Flashing Reglet by sheet metal contractor. The concrete contractor shall notify sheet metal contractor and co-operate with him so that he may place flashing reglet in the concrete forms of spandrel beams before forms are placed in position. Refer to sheet metal specifications for description of this flashing reglet.

Take precaution in the placing of concrete so that flashing reglet does not become damaged.

PARAPETS Sheet Metal

Furnish and install in all concrete parapets and other concrete walls rising above all roofs Cheney Flashing Reg-

let. Flashing reglet shall be as manufactured by The Cheney Company, Architects Building, Philadelphia, Pa.

Furnish and lock into flashing reglet a 16-ounce copper counterflashing lapping over the base flashing not less than 4 inches. Counterflashing shall be formed with $\frac{3}{8}$ -inch lip that self-locks into the flashing reglet and ends of counterflashing shall overlap not less than 2 inches.

Concrete

All concrete parapets and other concrete walls rising above all roofs are to be provided with Cheney Flashing Reglet by sheet metal contractor. This contractor shall notify sheet metal contractor and co-operate with him so that he may place flashing reglet in the concrete forms of spandrel beams before forms are placed in position. Refer to sheet metal specifications for description of this flashing reglet.

Take precaution in the placing of concrete so that flashing reglet does not become damaged.

The Warm Air Heating Ordinance of Salem, Oregon [Part 3]

Since January, 1936, we have published sections of the heating ordinance, of some city, in practically every issue. During this time the codes of Minneapolis; Ft. Wayne, Indiana; Toledo, Ohio; Sioux City, Iowa, have been published in full. This ordinance of Salem, Oregon, has been in effect since 1935 and, while not as detailed as some others, is a satisfactory code. This Part 3 covers return air systems, duct construction and fire hazards.

Section 7. (a). When baseboard or wall registers are used, they shall be properly sealed to the stack head in such a manner as to prevent any leakage of air between the head and the register.

(b). Floor registers shall be provided with boxes insulated from the wood or other combustible material by asbestos.

(c). Registers for warm air pipes, stacks, and fittings shall not be located in outside walls unless insulated with one inch air cell asbestos covering or its equivalent.

(d). Every furnace system shall have at least one opening without valve or louver and the pipe thereto shall be without damper.

Section 8. (a). Air shall not be supplied to any furnace from any basement or furnace room not occupied as living quarters, except fan rooms or plenum chambers.

(b). The cold air intake or return where air is taken from within the building shall have a net area through its entire length of not less than the combined net area of all warm air pipes leading from the furnace. This may be maintained in one or more ducts. No reverse incline or air trap will be allowed in any section of a cold air return of a gravity warm air heating system.

(c). When the cold air supply is taken wholly or in part from the outside of the building, the supply duct at its most contracted area must equal or exceed 80 per cent of the combined area of all warm air pipes leading from the furnace.

(d). Cold air ducts, except as stated in (f), shall be constructed of metal, tile, or other incombustible material having a smooth inner surface and shall maintain a constant net area throughout their entire lengths. All joints shall be made dust tight. Horizontal rectangular return ducts shall have at least 10 per cent greater than vertical connecting pipes.

(e). Where a boot or shoe is connected to the casing at the base, the opening shall not extend higher than a line on the level of the top of the grate of the furnace. The width of the shoe shall be of proper measurement to make the area at all points at least equal to that of the round or square pipe to which it is connected. This boot or shoe shall be of streamline transition construction.

(f). Wherever the space between joists is used to convey cold air overhead, all bridging and bracing shall be removed. The connection from a pan of galvanized iron not lighter than No. 26 gage and shall have a transition fitting, the top area of which shall be at least 10 per cent greater than the area of the connecting pipe. Galvanized iron shall be used for pans or enclosing joists.

(g). When it is necessary to set the furnace over a pit and connect cold air under the basement floor, such pit or cold air trench shall not exceed 18 inches in depth below the casing base ring and the width of the trench or trenches shall be of proper measurement to make the area at least 10 per cent greater than the pipe to which it is connected. The connection between the cold air pipe or

duct and the underground pit shall be made with a transition fitting as described in (f) of this section.

(h). The cold air face or faces shall be made of wood or metal. Where cold air face is placed in a vertical position, the open work of the face shall extend to within at least one inch of the floor line. The free area of cold air faces shall be at least equal to the free area of the duct or ducts to which they connect.

(i). The capacity of any vertical cold air face shall be determined by multiplying the base line in inches by not to exceed 14 inches in height and deducting for the grilles or cross bars.

(j). When a booster fan is installed in the air duct supply of a gravity system, the same net area of all ducts shall be maintained as calculated under Article III, section 1, and Article VI, Section 8.

Section 9. (a). The smoke pipe shall be as short and direct as consistent with the location of the furnace. It shall be made of metal not lighter than No. 24 gage and not less than the full size of the collar on the furnace throughout its entire length. It shall have no opening for attaching any fireplace, stove, range, water heater, gas or ventilating connection. It shall be lock seamed or riveted and all joints shall lap not less than one and a half inches and it shall be rigidly secured. Cast iron smoke pipe may be used.

(b). All smoke pipes on solid fuel burning furnaces shall be provided with check dampers placed on the side of the pipe or at the end of a tee. When cast iron smoke pipe dampers are used, they must be placed between the check damper and the furnace and supported on both sides of the pipe.

(c). Where the smoke pipe enters the flue, a thimble shall be cemented into the flue and the connection thereto made air tight. Should any smoke pipe come within 18 inches of any combustible material, such combustible material shall be covered with asbestos paper and a metal shield so fastened that a two inch air space exists between this shield and the combustible material. This shield shall be no less in size than twice the diameter of the smoke pipe and of sufficient length to cover the combustible material at all points.

(d). No smoke pipe shall project through any external wall or window. No furnace connection shall be made to a flue without a cast iron or steel clean out having first been provided in the flue. Such clean-out shall be not more than eight inches below the smoke pipe opening. The base of the flue shall be filled up to the bottom of the clean out, all of which shall be made air tight.

Section 10. Wherever furnaces or room heaters are supported by legs not less than five inches high and set on a combustible floor, the floor under same shall be covered with non-combustible material extending not less than twelve inches on sides and back of heater and 36 inches in front of said heater.

Section 11. (a). When but one duplex grating is used for both warm air and cold air in a so-called pipeless

(Continued on page 100)

RESIDENTIAL AIR CONDITIONING SECTION

WITH stoker sales showing yearly increases and sales possibilities for stokers offering a most promising future, installers of warm air furnaces are finding increasing buying interest in the furnace-stoker combination.

We have learned, as a result of experience, that (like the gas or oil conversion burner) there is something more to furnace-stoker operation than the mere addition of the stoker to a new or remodeled furnace. We have learned that something must be done about controls, that over-fire air is detrimental to economy, that off-cycles of the stoker constitute an important fuel consumption period, that fly ash is a handicap, that combustion space is essential.

In this issue we publish part 1 of the stoker research report from the Research Residence. In these tests, for the first time, the stoker-furnace combination, rather than the stoker alone, was scrutinized. The conclusions are only preliminary, but well worth study.

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Performance of Stoker-Fired and Hand-Fired Warm-Air Furnaces in the Research Residence

By A. P. Kratz,* S. Konzo,** and R. B. Engdahl,*** (MEMBERS) Urbana, Ill.

Introduction

Preliminary Statement

THE investigations in forced-air heating in the Research Residence at the University of Illinois during the period from 1932 to 1934 were confined to studies¹ of the characteristics of the forced-air heating system under actual service conditions. For these investigations the fuel used was anthracite. During the period from 1934 to 1937 the performance and operating characteristics were determined^{2,3} of a warm-air furnace equipped with a conversion oil-burning unit and of a warm-air furnace designed specifically for oil firing. During the heating season of 1937-1938, these investigations were extended to include the comparison of the performance and operating characteristics of a thermostatically-controlled hand-fired, warm-air furnace burning a high volatile bituminous coal, with those of the same furnace fired by means of a domestic stoker, of the underfeed type. In order to obtain comparable data no changes were made in the furnace itself, in the plant, in the volume of air circulated, nor in the settings of the thermostat when the stoker was substituted for hand firing. Furthermore, in each case, coal from the same mine and of the size usually recommended for the particular method of firing was used.

Description of the Research Residence and Heating Equipment

The Research Residence in Urbana, Ill., and the heating plant have been completely described in a previous publication.⁴ The Residence is a three-story structure of standard frame construction, in which the walls are not insulated, and no weatherstripping is used at the windows nor at the doors. The wall section consists of lap siding, building paper, sheathing, 6-in. studding, wood lath, and plaster with rough sand finish. The windows are double hung, and during all of the tests reported in this paper they remained tightly locked.

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¹University of Illinois, *Engineering Experiment Station Bulletin* 266, by A. P. Kratz and S. Konzo, 1934.

²Performance of Oil-Fired, Warm-Air Furnaces in the Research Residence, by A. P. Kratz and S. Konzo. (A.S.H.V.E. JOURNAL SECTION, *Heating, Piping and Air Conditioning*, December, 1936, p. 693-704.)

³Study of Methods of Control and Types of Registers as Affecting Temperature Variations in the Research Residence, by A. P. Kratz and S. Konzo. (A.S.H.V.E. JOURNAL SECTION, *Heating, Piping and Air Conditioning*, December, 1937, p. 745-757.)

⁴Loc. cit. Note 1.

Presented at the 45th Annual Meeting of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Pittsburgh, Pa., January, 1939. Reprinted by permission.

The total space heated consisted of three rooms, a sun room, a breakfast nook, and a hallway on the first story; three rooms, a bathroom, and a hallway on the second story; and two rooms, a bathroom, and a hallway on the third story. The total volume of this heated space, from which the basement was excluded, was approximately 17,540 cu ft. The calculated heat losses were approximately 159,000 Btu per hour at an indoor-outdoor temperature difference of 80 F. The Residence is completely furnished, and during the heating season it was occupied by six people.

The heating plant consisted of a warm-air furnace used in connection with a forced-air heating system. Three cold-air returns were used and were connected into a cold-air box above the inlet to a centrifugal type of fan. The furnace was placed at the East end of the basement, and the warm-air registers were served from two main trunk systems.

The furnace used in all of the tests made with both the hand firing and stoker firing was thermostatically controlled, was of the cast-iron circular-radiator type, having a 27-in. firepot and 23-in. grate, and was equipped with a casing 50 in. in diameter. The areas of the heating surfaces and the dimensions of the furnace are presented in Table 1.

In order to install the mechanical stoker, which was inserted through the ash-pit door of the furnace, the grates were removed, and firebrick were arranged to form a flat hearth as shown in Fig. 1. The stoker was of the underfeed type, and coal was delivered from the hopper by means of a rotating screw to the retort, which was located in the middle of the hearth. The hopper had a capacity of 300 lb. Both the rate of fuel input and the rate of air supplied to the tuyeres could be independently regulated. In the case of the tests reported in this paper, the rate of fuel input was maintained at 48.6 lb per hour and the rate of air input was adjusted to provide for satisfactory combustion conditions. In this case the CO₂ content of the flue gas was maintained at approximately 11 per cent when the stoker was in operation, and a slightly hazy atmosphere over the fuel bed was obtained. The rate of air input was not sufficient to blow particles of coal away from the fuel bed.

The rate of burning of the fuel is dependent on the rate of air supply to the fuel bed. It may be observed, however, that in the case of the domestic stoker of the underfeed type the rate of burning of the fuel is not necessarily the same as, and is usually less than, the rate of fuel input to the furnace. If the rate of burning of the fuel in an underfeed stoker were equal to the rate of fuel

Table 1—Dimensions and Areas of Furnace Used

Grate diameter	23 in.
Grate area	2.88 sq ft
Firepot diameter	27 in.
Heating surface	
ash-pit	1.36 sq ft
firepot	8.10 sq ft
dome	18.87 sq ft
radiator	31.93 sq ft
Total	60.26 sq ft
Ratio of heating surface to grate area.....	20.9
Casing diameter	50 in.
Free area through casing.....	4.97 sq ft
Combustion space ^a	8.8 cu ft
Free area through over-fire damper.....	4.9 sq in.

^aCombustion space is defined in this case as the space above the hearth level, including the dome, but not the feed neck.

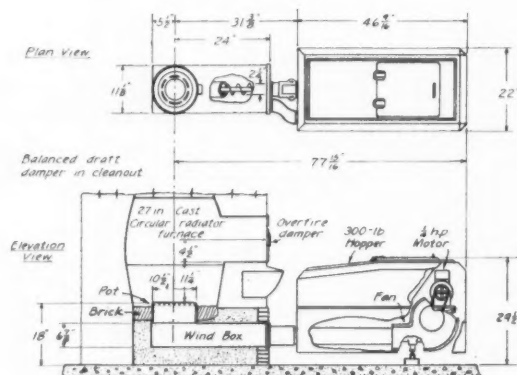


Fig. 1—Diagram of conversion stoker installation in furnace. Research Residence, Season 1937-38, Series 3-37 and 4-37

input, as it is on the chain grate stoker, then no excess fuel would be available in the firepot to maintain combustion during the off-periods. It is probable that with intermittent operation of the stoker, with a given rate of fuel input and depth of fuel bed, some leeway exists in the adjustment of the air volume which will result in satisfactory combustion conditions, and which will at the same time not materially change the level of the fuel bed. Hence, in the case of intermittent operation of the stoker in which some air is inevitably supplied to the fuel bed during the off-period, the rate of burning of the fuel should be such that:

1. Satisfactory combustion conditions are maintained.
2. Sufficient coal remains in the fuel bed when the stoker operation is stopped to allow for combustion during the off-periods of the stoker.
3. Sufficient heat is generated to handle the maximum demands of the house, and
4. The particles of coal are not blown away from the fuel bed.

The fuel burned in these tests was a high-volatile bituminous coal obtained from Saline County, Ill. The characteristics of the fuel are shown in Table 2. In general the fuel used proved satisfactory for both hand firing and stoker firing.

The centrifugal fan in the forced-air system delivered approximately 1675 cfm of air which was recirculated through the house. Six replaceable air filters of the viscous-coated fiber type, each 16 in. x 25 in., were installed on the inlet side of the fan.

The control of the heating plant was accomplished by means of a room thermostat operating to start and stop the stoker motor, or to open and close the ash-pit damper, and to start and stop the circulating fan as shown in Fig. 2. This room thermostat was used in conjunction with two bonnet thermostats which served as high- and low-limit controls for the temperature of the air in the furnace bonnet. The settings for the thermostats are shown in Table 3.

This method of control⁵ was highly satisfactory for previous installations in which anthracite and oil fuels were burned, and also proved to be equally satisfactory for both hand firing and stoker firing of bituminous coals. As indicated by the broken lines in the upper right hand portion of Fig. 2, a contact was provided in the bonnet thermostat which closed the fan circuit when the bonnet temperatures exceeded, or over-ran, a temperature of 195 F. This same basic control system was used for the stoker-fired plant and, in addition, an auxiliary switch, designated as the hold-fire time switch, was included. This time-switch is indicated by the broken line in the lower part of Fig. 2. If the bonnet temperature were less than 125 F and if the stoker remained inoperative for 30 min, the time switch closed and the stoker was caused to operate for a two-minute period. This period of operation was sufficient to maintain the fire in the fuel bed, and, except during very mild days when there existed no demand for heat, did not cause any unsatisfactory over-heating in the rooms in the house.

The room thermostat, which was of the heat-anticipating type, was located on an inside wall of the dining room at a height 60 in. from the floor, and was adjusted to maintain an average air temperature of approximately 72 F at the 60-in. level in all of the rooms of the Residence.

Method of Conducting Tests

The fan and the damper motor, or stoker, were automatically controlled to maintain an average temperature of 72 F in the rooms of the house both day and night.

Observations of weather, indoor room air temperatures, room relative humidities, and other incidental data were made daily at 7:00 a. m., 11:00 a. m., 4:00 p. m.,

⁵Control Type IV described in the paper, Automatic Controls for Forced-Air Heating Systems, by S. Konzo and A. F. Hubbard, (A.S.H.V.E. TRANSACTIONS, Vol. 40, 1934, p. 37-54.)

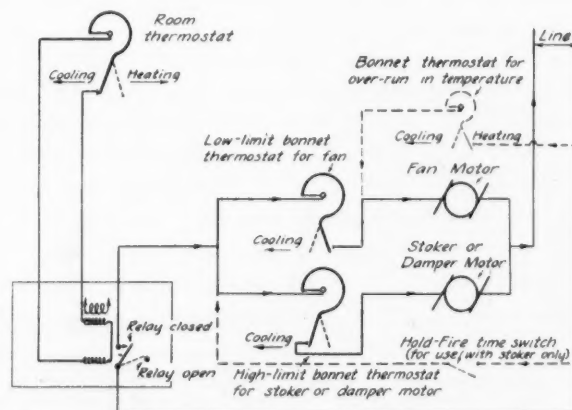


Fig. 2—Simplified wiring diagram for control of fan motor and stoker motor (or damper motor). Research Residence installation, Season 1937-38, Series 1-37, 3-37 and 4-37

Table 2—Characteristics of Coals

GENERAL DESIGNATION		
Size	Stove (2 in. x 1½ in.)	Stoker (1 in. x 10 mesh)
State	Illinois	Illinois
Vein.....	No. 5	No. 5
County	Saline	Saline
Type	Non-caking	Non-caking
Treatment	Washed, oil-treated	Washed, oil-treated
PROXIMATE ANALYSIS (As received) per cent:		
Moisture	3.50	8.50
Volatile Matter	38.22	30.96
Fixed Carbon	51.61	53.15
Ash	6.67	7.39
ULTIMATE ANALYSIS (Dry basis) per cent:		
Carbon	76.30	74.95
Hydrogen	4.90	4.73
Oxygen	8.28	8.94
Nitrogen	1.56	1.47
Sulphur	2.07	1.84
Ash	6.89	8.07
CALORIFIC VALUE, Btu per pound:		
Coal As Received.....	13041	12107
Dry Coal	13514	13232
Unit Coal	14670	14550
Air required, pound per pound		
dry coal	10.3	10.0
Friability Index, D_w , per cent ^a ...	39.8	39.8
ASH CHARACTERISTICS, deg F. ^b		
Initial Deformation	1925	1925
Softening Temperature	2000	2000
Fluid Temperature	2193	2193

^aUniversity of Illinois Engineering Experiment Station Bulletin No. 218.^bAverage values from Illinois State Geological Survey for Saline County coal.

Table 3—Approximate Thermostat Settings, deg F

	HAND FIRED	STOKER FIRED
Room thermostat setting.....	72	72
Lower-limit bonnet thermostat for fan motor		
Make circuit ^a	125	125
Break circuit ^a	110	110
High limit bonnet thermostat for stoker or damper motor		
Make circuit ^a	135	135
Break circuit ^a	150	150
Bonnet thermostat for over-run in temperature		
Make circuit ^a	195	195
Break circuit	190	190
Hold-fire time-switch.....		2 min opera- tion every 30 min

^aThese temperatures are not settings. They correspond to the actual air temperatures in the bonnet outlet as obtained from the temperature recorder in the North Trunk.

and 10:00 p. m. Complete data were obtained for each 24-hour test period on the fuel consumption, weight of ash and clinkers removed, the total integrated time of operation of the fan and of the stoker, the total electrical energy consumption of the fan and of the burner motors, and the total number of on-periods of both the circulating fan and stoker. Daily observations were made of the volume of air circulated, and the filters were cleaned with sufficient frequency to maintain the air volume constant. In addition, continuous records of temperatures and CO₂,

such as are shown in the typical records in Figs. 3, 4, and 5, were obtained for each 24-hour period. Continuous records of the index of smoke density were also obtained by means of the apparatus shown in Fig. 6. Observations were made, as will be explained in detail later, on the time consumed in attending the furnace.

For each series of tests, data were obtained for a wide range of outdoor weather conditions, and significant values for each 24-hour period were plotted against the difference in temperature existing between the indoors and outdoors for the same period, as shown in Figs. 7 to 11 inclusive. The plotted points deviate to some extent from the curves representing the average of the observed data, and these deviations can be partly attributed to the wind and sun effects which cannot be represented on curves based on temperature difference alone.

In the first series of tests, which has been designated as Series 1-37, the furnace was fired by hand at 11 a. m., 4 p. m., 10 p. m., and 7 a. m. daily. The fuel bed was poked, grates shaken, and ashes and clinkers removed once each day at 11 a. m. except in extremely mild weather when the fuel bed was disturbed only once every two or three days. Previous to each firing of the fuel the live coals and coke in the fuel bed were shoved back toward the rear of the firepot and the fresh charge of coal was fired in the front. The over-fire damper in the firing door was left wide open at all times. Both the ash-pit damper and the check damper in the smoke pipe were operated by means of the damper motor. With the fuel used, the rate of combustion was found to be extremely responsive to increases in draft. The method of firing employed and the attention given to the furnace may be considered as simulating normally good firing practice.

In the second series of tests, which has been designated as Series 3-37, the furnace was fired by means of the mechanical stoker. At 11 a. m. each day the clinkers were removed, the fuel bed levelled, and the hopper filled with coal. During extremely mild weather no attention was given the fuel bed or hopper, except as required every two or three days. The over-fire damper in the firing door was left open at all times. A balanced check damper was installed in the clean out of the chimney and was adjusted to maintain a draft in the smoke pipe of approximately 0.05 in. of water.

It was observed in the second series of tests that considerable burning accompanied by low CO₂ content of the flue gas occurred during the off-periods of the stoker. Since the burning that occurred during these relatively long periods was undoubtedly augmented by the air entering through the over-fire damper, the third series of tests, designated as Series 4-37, was run with the over-fire damper closed. In all other respects the method of operation was identical with that used in Series 3-37.

Operation of Circulating Fan

For these tests, which were made to study the comparative performance of the hand-fired and stoker-fired furnace plants under actual service conditions, both the circulating fan and coal stoker were operated intermittently by means of the automatic control system, so as to maintain uniform air temperatures in the house at all times. In determining the performance characteristics for each method of operation, data were obtained on the

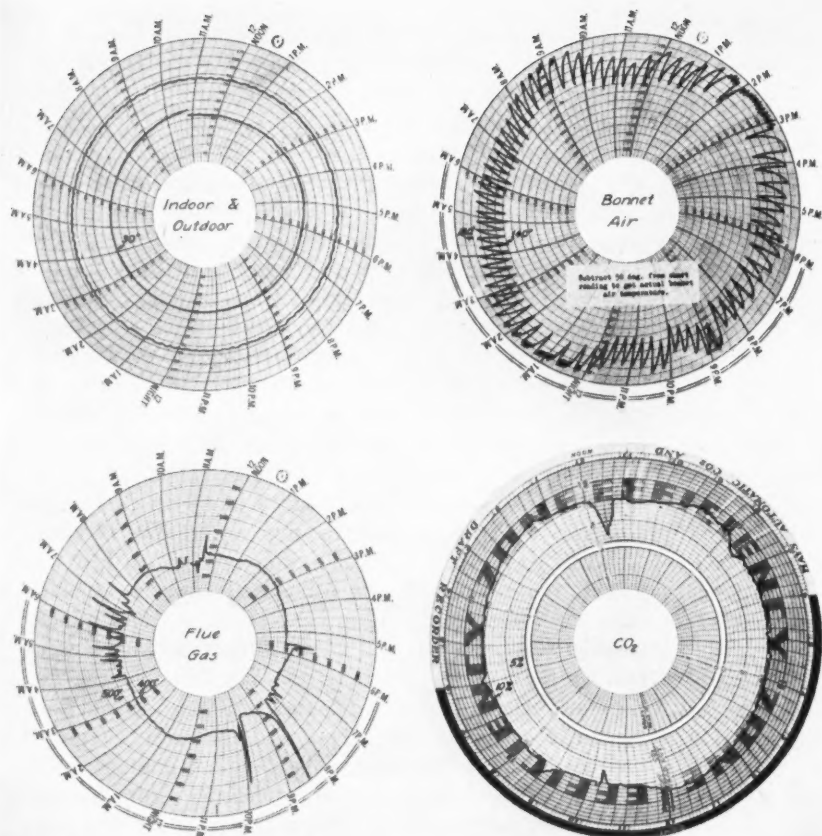


Fig. 3—Temperature and CO₂ records for hand-fired plant (over-fire damper open). Season 1937-38, Series 1-37, Test No. 1256. Forced-air heating system, cast, circular radiator, 27-in. furnace. Bituminous coal, 2 in. x 3 in. stove size

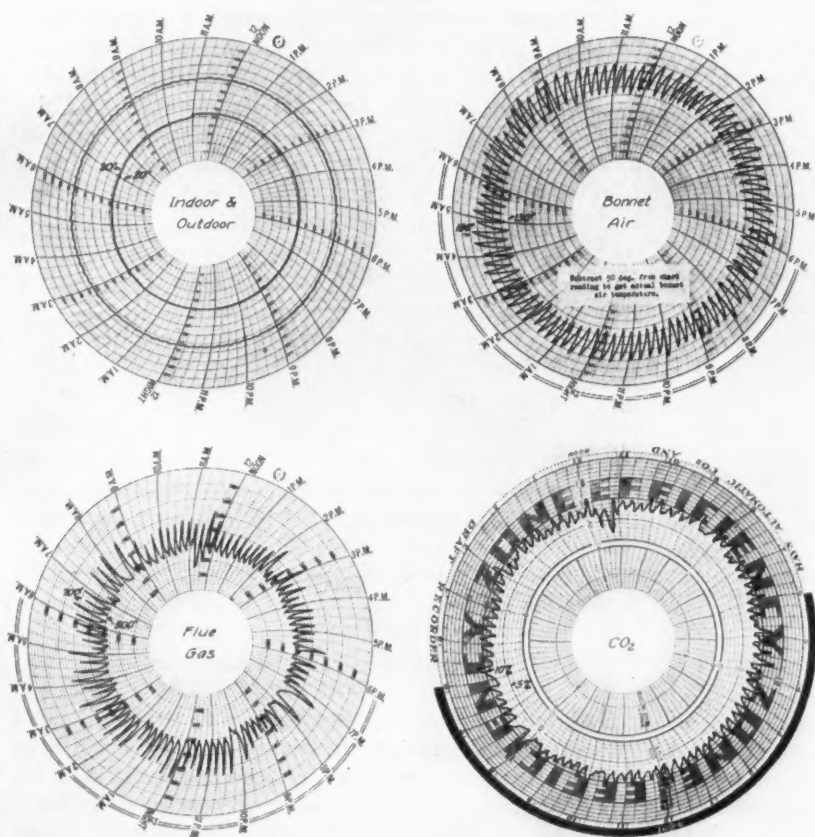


Fig. 4—Temperature and CO₂ records for stoker-fired plant (over-fire damper open). Season of 1937-38, Series 3-37, Test No. 1265. Forced-air heating system, cast, circular radiator, 27-in. furnace. Bituminous coal, 1-in. stoker size

operation of the fan, the consumption of fuel, the operation of the stoker, the time consumed in attending the furnace, and the production of smoke. A comparison of the performance of the heating plant for an average heating day is of interest. For Urbana, Ill., the average outdoor temperature during the heating season is 38 F. Hence for an indoor air temperature of 72 F the value of the average temperature difference between indoors and outdoors is 34 F. The comparisons based on this temperature difference may be regarded as indicative of the results to be secured from the entire heating season.

As shown in Fig. 7, the total number of times the fan was operated, the total hours of fan operation, and the energy consumption of the fan motor per day were each smaller for the hand-fired plant than for the stoker-fired plant. It may be observed that for a temperature difference between indoors and outdoors of 34 F, the energy consumption of the fan was 2.1 and 2.8 kwhr for the hand-fired and stoker-fired plants respectively. This difference can be accounted for by the fact that with the hand-fired plant the mean of the actual bonnet air temperatures was higher than that for the stoker-fired plant, as shown in Fig. 8, and hence the demand of the room thermostat was satisfied by the delivery of warmer air for shorter periods of time.

It should be observed that the actual setting of the bonnet thermostat was the same for all tests, but on account of the larger amount of off-period burning that occurred in the hand-fired plant when the ash-pit damper was closed, the whole range of bonnet air temperatures, and hence the mean bonnet air temperature, that was maintained was higher than that for the stoker-fired plant. The lower limit of the temperature range was high in the case of the hand-fired plant because there was sufficient burning during the off-period, so that, sometimes, when the room thermostat demanded heat, the fan operated. However, the bonnet temperature did not decrease enough to actuate the bonnet thermostat in the damper motor line and thus open the ash-pit damper. When the bonnet air temperature became excessively high, the over-run contact shown in Fig. 2 closed; the fan operated irrespective of whether or not any demand for heat existed, and the bonnet air tempera-

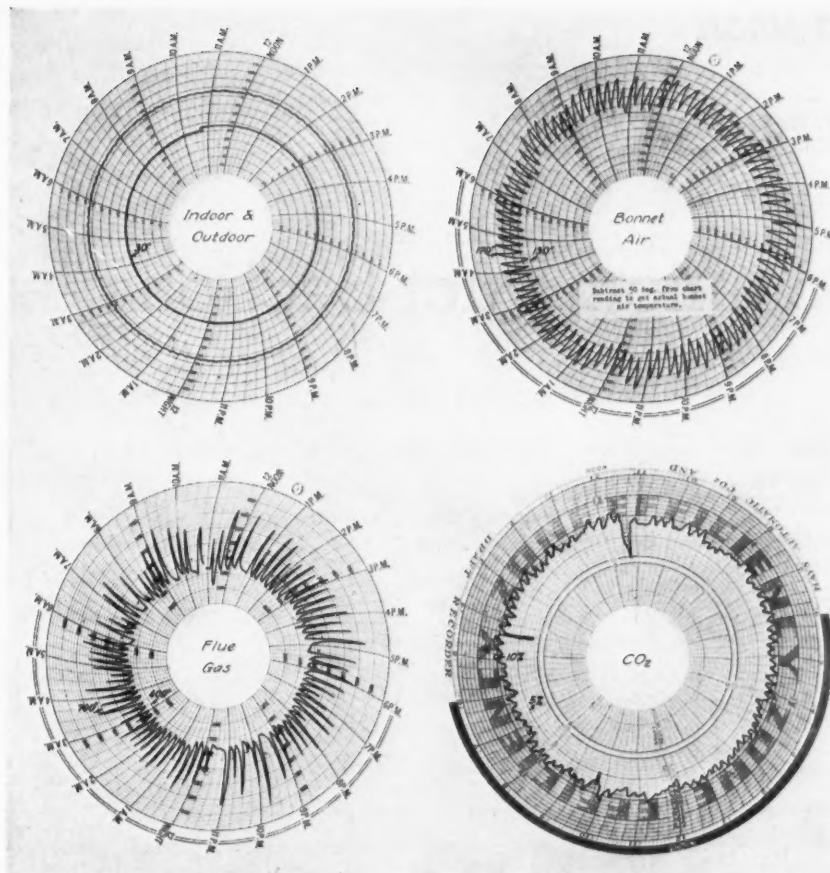


Fig. 5—Temperature and CO₂ records for stoker-fired plant (over-fire damper closed). Season of 1937-38, Series 4-37, Test No. 1311. Forced-air heating system, cast, circular radiator, 27-in. furnace. Bituminous coal, 1-in. stoker size

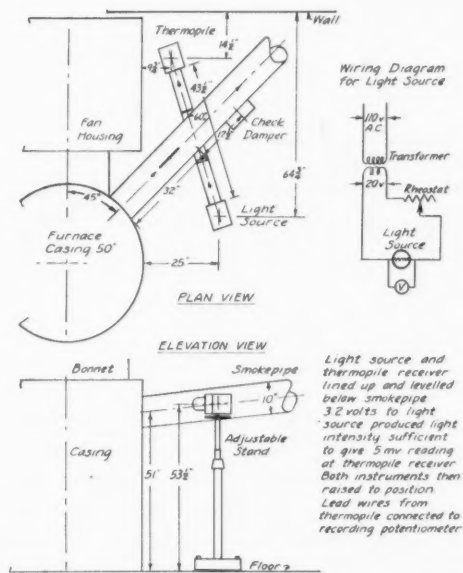


Fig. 6—Details of installation of smoke density recording instrument in Research Residence, 1937-38

tures were reduced below the upper limit temperature of 195 F. The bonnet air temperatures accompanying these periods of minor cycle operation are shown in the chart for bonnet air temperatures in Fig. 3. The frequency of these minor cycles in total number of operations per day is shown in the upper part of Fig. 7. On account of the slightly greater gravity action during the

off-periods of the fan, resulting from the higher bonnet air temperatures, some amount of temperature over-run occurred in the second and third story rooms, even in moderate weather. The temperatures were, however, not unsatisfactory from the standpoint of comfort.

In the case of the stoker-fired plant the combustion rate was greatly diminished when the stoker ceased operation; the bonnet air temperatures were maintained within a lower range, as shown in Fig. 8; and no minor cycles of fan operation resulted. Hence, for moderate or severe weather conditions no overheating occurred in any part of the house. In extremely mild weather the maintenance of the fire by means of the hold-fire switch tended to produce some overheating in the house, particularly in the rooms on the second and third stories.

It is probable that if the combustion during the off-periods had occurred in the same manner for both the hand-fired and stoker-fired plant, the range of bonnet air temperatures would have been the same, and the performance of

(Continued on page 94)

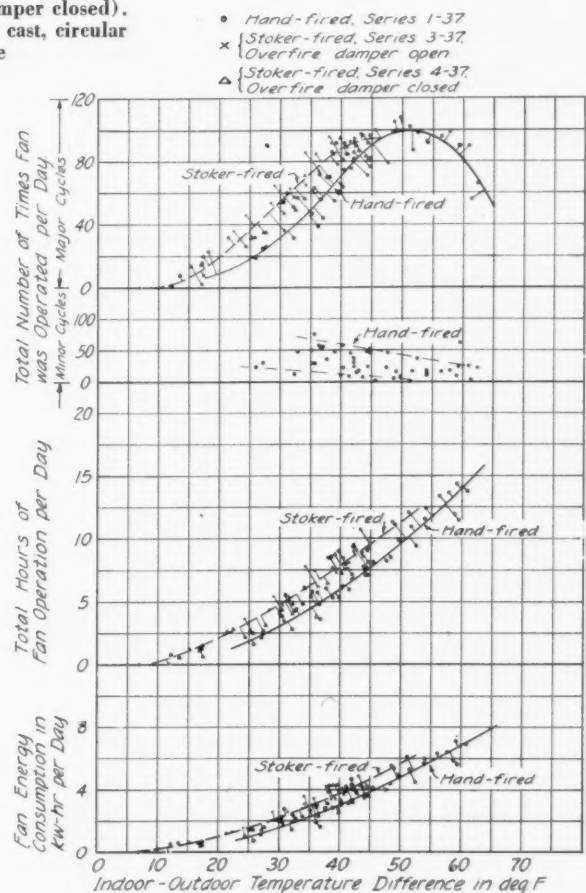


Fig. 7—Operating characteristics of fan. Research Residence tests. Cast, circular radiator, 27-in. furnace. Season 1937-38, Series 1-37, 3-37 and 4-37

Weights of Galvanized Iron and Labor Time Required for

Fabricating Common Duct Sections

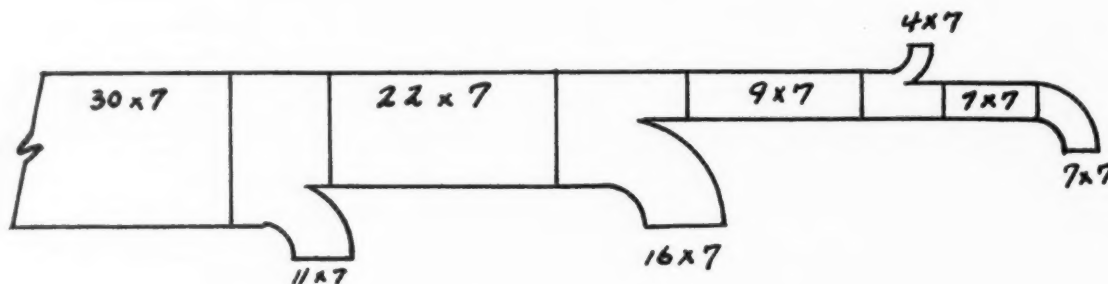
IN our January issue we published part 1 of Duct and Fitting Chart designed by E. B. Root, Manager, Heating and Air Conditioning Division of Nelson Company, Detroit, Michigan. More of these charts are published in this issue. For Mr. Root's second article, he makes the following observations:

"The success of a mechanical warm air heating system depends to a large extent upon the design of the duct system. I recommend that the Technical Code for the Design and Installation of Mechanical Warm Air Heating Systems be carefully followed.

"With this thought in mind I wish to call attention to the charts illustrating reducing or "Y" Joints with various sized branches. It will be noted that the large end of the Y joint is indicated by dimension "A", the small end by dimension "B". The amount that the trunk line is reduced by the taking off of a branch (dimension "D") is indicated as A-B. According to these charts where dimension "D" is 4 x 7, dimension A-B will be 2 inches, 5 x 7—3 inches, 6 x 7—4 inches, etc.,

"The schedule of duct sizes would be as follows:

Stack No.	Branch Trunk C.F.M.	Main Trunk	Rd. Pipe Before Corr.	Corr. Factor	Rd. Pipe Corr.	Rect. Equiv.
1		150	7.5			7 x 7
2		80	5.9			4 x 7
		230	8.8			9 x 7
4	150					
5	125					
	275					
6	90					
	365					
7	105					
		470	11.5			16 x 7
		700	13.2			22 x 7
3		300	9.7			11 x 7
		1000	15.2			30 x 7



up to 16 x 7 which will reduce the trunk line 12 to 13 inches. (See last 2 columns in Table for Reducing Joint With One Branch.)

"These values were obtained by designing the system on a static pressure of .08 inch water gauge per 100 feet. Example:

It is desired to handle 1000 cfm through a duct at .08 SP with four branches handling the following volumes of air in the order mentioned.

Stack No. 1.....	150 CFM
Stack No. 2.....	80 CFM
Branch Trunk	470 CFM
Stack No. 3.....	300 CFM
Total	1000 CFM

"It will be noted that stack No. 1 is the last supply on the trunk line and requires 7 x 7 duct. Stack No. 2 requires a 4 x 7 and adds 2 inches to the main duct. The branch trunk line requires a 16 x 7 duct and adds 13 inches to the trunk line. Stack No. 3 requires an 11 x 7 duct and adds 8 inches to the main trunk line.

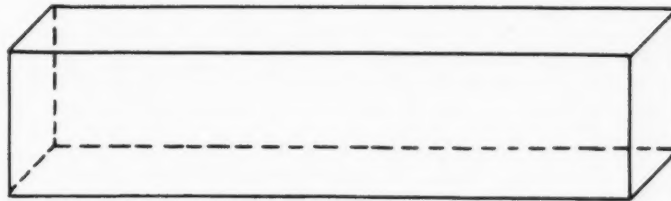
Correcting for Equivalent Lengths

"If the system is designed strictly according to code, it is necessary to correct the diameter of round pipes of unequal equivalent lengths in order that any and all pipes, regardless of their equivalent lengths, will handle any required cfm at the same predetermined static pressure. This is accomplished by multiplying the round-pipe diameter by correction factors as shown in table 9 of the Technical Code.

"On the larger jobs, these corrections will of necessity change the amount a trunk line will be reduced by a given size branch. Since these charts were designed for the purpose of determining the weight of material

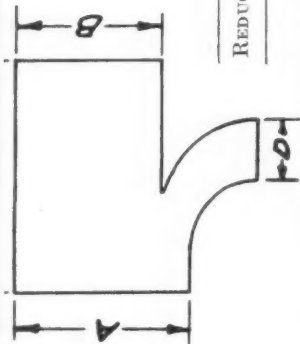
and time required for fabrication of ducts from field measurements, the cost of time and material would not be affected by the slight changes resulting from the use of Table 9."

The first group of tables in this series appeared in the January, 1939 issue. A very limited supply of tear sheets of those tables is available to anyone who wants to make a complete file. Additional tables will appear in March and perhaps April.



WEIGHT AND TIME FOR RECTANGULAR DUCTS PER JOINT

WIDTH	DEPTH 7"															
	1'		2'		3'		4'		5'		6'		7'		8'	
	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME
44	10.4	30'	20.8	30'	31.2	30'	41.6	60'								
42	10.0	30'	20.0	30'	30.0	30'	40.0	60'								
40	9.6	30'	19.3	30'	28.9	30'	38.5	60'								
38	9.2	30'	18.5	30'	27.7	30'	37.0	60'								
36	8.8	30'	17.7	30'	26.5	30'	35.4	60'								
34	8.5	30'	16.7	30'	25.4	30'	33.9	60'								
32	6.3	30'	12.6	30'	19.0	30'	25.4	30'	31.7	30'	38.0	30'	44.3	30'	50.7	30'
30	6.0	30'	12.1	30'	18.1	30'	24.2	30'	30.2	30'	36.2	30'	42.3	30'	48.3	30'
28	5.7	30'	11.5	30'	17.2	30'	23.0	30'	28.7	30'	34.4	30'	40.2	30'	45.9	30'
26	5.4	30'	10.9	30'	16.3	30'	21.8	30'	27.2	30'	32.6	30'	38.1	30'	43.5	30'
24	5.1	30'	10.3	30'	15.4	30'	20.5	30'	25.7	30'	30.8	30'	35.9	30'	41.0	30'
22	4.8	30'	9.7	30'	14.5	30'	19.3	30'	24.2	30'	29.0	30'	33.8	30'	38.6	30'
20	4.5	30'	9.1	30'	13.6	30'	18.1	30'	22.7	30'	27.2	30'	31.7	30'	36.2	30'
18	4.2	30'	8.5	30'	12.7	30'	16.9	30'	21.2	30'	25.4	30'	29.6	30'	33.8	30'
16	3.9	30'	7.9	30'	11.8	30'	15.7	30'	19.7	30'	23.6	30'	27.5	30'	31.4	30'
14	3.6	30'	7.2	30'	10.9	30'	14.5	30'	18.1	30'	21.7	30'	25.3	30'	29.0	30'
12	3.3	30'	6.6	30'	10.0	30'	13.3	30'	16.6	30'	19.9	30'	23.2	30'	26.6	30'
10	3.0	30'	6.0	30'	9.1	30'	12.1	30'	15.1	30'	18.1	30'	21.1	30'	24.2	30'
9	2.9	20'	5.7	20'	8.6	20'	11.5	30'	14.4	30'	17.2	30'	20.1	30'	23.0	30'
8	2.7	20'	5.4	20'	8.2	20'	10.9	30'	13.6	30'	16.3	30'	19.0	30'	21.8	30'
7	2.6	20'	5.1	20'	7.7	20'	10.3	30'	12.9	30'	15.4	30'	18.0	30'	20.6	30'
6	2.4	20'	4.8	20'	7.3	20'	9.7	25'	12.1	30'	14.5	30'	16.9	30'	19.4	30'
5	2.3	20'	4.5	20'	6.8	20'	9.1	25'	11.4	30'	13.6	30'	15.9	30'	18.2	30'
4	2.1	20'	4.2	20'	6.4	20'	8.5	25'	10.6	25'	12.7	30'	14.8	30'	17.0	30'



REDUCING JOINT WITH ONE BRANCH

DEPTH OF DUCT 7"

C	27"		24"		21"		18"		17"	
	D	A-B	D	A-B	D	A-B	D	A-B	D A-B	D A-B
	16x7	(12")	14x7	(10")	12x7	(8")	10x7	(7")	9x7-6" 8x7-5" 7x7-4"	6x7-4" 5x7-3" 4x7-2"
A	27"		24"		21"		18"		17"	
	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME
44x7	30.0	90'	26.4	90'	22.5	90'	19.2	90'	17.9	90'
42x7	29.1	90'	25.5	90'	21.9	90'	18.6	90'	17.4	90'
40x7	28.3	90'	24.6	90'	21.3	90'	18.0	90'	16.8	90'
38x7	27.4	90'	23.8	90'	20.6	90'	17.5	90'	16.2	90'
36x7	26.6	75'	23.1	75'	19.9	75'	16.9	75'	15.7	75'
34x7	25.8	75'	22.3	75'	19.3	75'	16.3	75'	15.1	75'
32x7	19.5	60'	16.9	60'	14.7	60'	12.3	60'	11.4	60'
30x7	18.9	60'	16.3	60'	14.2	60'	11.9	60'	10.9	60'
28x7	18.2	60'	15.7	60'	13.6	60'	11.4	60'	10.5	60'
26x7	17.5	60'	15.1	60'	13.1	60'	11.0	60'	10.1	60'
24x7	16.8	45'	14.5	45'	12.5	45'	10.5	45'	9.7	45'
22x7	16.1	45'	13.9	45'	12.0	45'	10.0	45'	9.3	45'
20x7	15.4	45'	13.3	45'	11.4	45'	9.6	45'	8.9	45'
18x7	14.8	45'	12.7	45'	10.9	45'	9.2	45'	8.5	45'
16x7			12.1	45'	10.3	45'	8.7	45'	8.1	45'
14x7					9.8	45'	8.3	45'	7.7	45'
12x7							7.8	45'	7.2	45'
10x7									6.4	30'
9x7									5.9	30'
8x7									5.4	30'
7x7									5.0	30'
6x7									4.7	30'

WEIGHT AND TIME FOR RECTANGULAR REDUCING JOINTS—NO BRANCH

	7"		8"		9"		10"		12"	
	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME
44	31.8	30'	32.4	30'	32.5	30'	33.0	30'	34.1	30'
42	30.6	30'	31.2	30'	31.3	30'	31.8	30'	33.0	30'
40	29.5	30'	30.1	30'	30.1	30'	30.6	30'	31.8	30'
38	28.3	30'	28.9	30'	28.9	30'	29.5	30'	30.6	30'
36	27.2	30'	27.7	30'	27.7	30'	28.3	30'	29.5	30'
34	26.0	30'	26.5	30'	26.5	30'	27.2	30'	28.3	30'
32	19.5	30'	19.9	30'	19.9	30'	20.4	30'	21.3	30'
30	18.1	30'	18.6	30'	19.0	30'	19.5	30'	20.4	30'
28	17.2	30'	17.7	30'	18.1	30'	18.5	30'	19.5	30'
26	16.3	30'	16.8	30'	17.2	30'	17.7	30'	18.6	30'
24	15.4	30'	15.9	30'	16.3	30'	16.8	30'	17.7	30'
22	14.5	30'	15.0	30'	15.4	30'	15.9	30'	16.8	30'
20	13.6	30'	14.1	30'	14.5	30'	15.0	30'	15.9	30'
18	12.7	30'	13.2	30'	13.6	30'	14.0	30'	14.9	30'
16	11.8	30'	12.3	30'	12.7	30'	13.1	30'	14.0	30'
14	10.9	30'	11.4	30'	11.8	30'	12.2	30'	13.1	30'
12	10.0	30'	10.5	30'	10.9	30'	11.3	30'	12.2	30'
10	9.1	30'	9.6	30'	10.0	30'	10.4	30'	11.3	30'
9	8.6	20'	9.2	20'	9.5	20'	10.0	20'	10.9	20'
8	8.2	20'	8.7	20'	9.1	20'	9.5	20'	10.4	20'
7	7.7	20'	8.3	20'	8.6	20'	9.1	20'	10.0	20'
6	7.3	20'	7.8	20'	8.2	20'	8.6	20'	9.5	20'

WEIGHT AND TIME FOR VERTICAL OFFSETS

WIDTH GAUGE	7'		8'		9'		10'		12'	
	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME
44	21.3	110'	23.6	110'	25.9	110'	28.3	110'	32.0	110'
42	20.6	100'	22.8	100'	25.0	100'	27.4	100'	31.0	100'
40	19.9	95'	22.0	95'	24.1	95'	26.5	95'	30.0	95'
38	19.1	90'	21.2	90'	23.3	90'	25.6	90'	29.0	90'
36	18.4	90'	20.4	90'	22.5	90'	24.6	90'	28.0	90'
34	17.7	85'	19.5	85'	21.6	85'	23.7	85'	27.0	85'
32	13.3	80'	14.7	80'	16.3	80'	17.9	80'	20.5	80'
30	12.7	80'	14.0	80'	15.6	80'	17.1	80'	19.8	80'
28	12.1	75'	13.4	75'	14.9	75'	16.3	75'	19.0	75'
26	11.5	75'	12.8	75'	14.2	75'	15.6	75'	18.2	75'
24	11.0	70'	12.2	70'	13.5	70'	14.9	70'	17.5	70'
22	10.4	65'	11.5	65'	12.9	65'	14.2	65'	16.7	65'
20	9.8	65'	10.9	65'	12.2	65'	13.4	65'	16.0	65'
18	9.3	60'	10.3	60'	11.5	60'	12.7	60'	15.3	60'
16	8.6	60'	9.7	60'	10.8	60'	12.0	60'	14.5	60'
14	8.1	55'	9.1	55'	10.2	55'	11.3	55'	13.7	55'
12	7.6	50'	8.5	50'	9.5	50'	10.5	50'	13.0	50'
10	6.9	50'	7.8	50'	8.8	50'	9.8	50'	12.2	50'
9	6.6	45'	7.5	45'	8.5	45'	9.4	45'	11.8	45'
8	6.4	45'	7.2	45'	8.2	45'	9.1	45'	11.4	45'
7	6.1	40'	6.9	40'	7.8	40'	8.7	40'	11.0	40'
6	5.7	35'	6.6	35'	7.4	35'	8.4	35'	10.7	35'
5	5.4	35'	6.3	35'	7.1	35'	8.0	35'	10.3	35'
4	5.2	30'	5.9	30'	6.7	30'	7.6	30'	9.9	30'

WEIGHT AND TIME FOR Y JOINTS

WIDTH	7'		8'		9'		10'		12'	
	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME	WEIGHT	TIME
44	52.0	150'	52.6	150'	54.8	150'	55.0	150'	57.2	150'
42	51.6	140'	52.2	140'	53.4	140'	54.6	140'	56.8	140'
40	45.2	130'	45.8	130'	47.0	130'	48.0	130'	50.2	130'
38	44.8	120'	45.4	120'	46.6	120'	47.6	120'	49.8	120'
36	38.8	110'	39.5	110'	40.4	110'	41.4	110'	43.4	110'
34	38.4	100'	39.1	110'	40.0	100'	41.1	100'	43.0	100'
32	31.4	90'	31.9	90'	32.8	90'	33.8	90'	35.5	90'
30	30.8	60'	31.6	60'	32.5	60'	33.5	60'	35.2	60'
28	25.9	60'	26.7	60'	27.4	60'	28.2	60'	29.9	60'
26	25.6	60'	26.4	60'	27.1	60'	27.9	60'	29.6	60'
24	21.1	60'	21.9	60'	22.6	60'	23.4	60'	24.7	60'
22	20.8	50'	21.6	50'	22.3	50'	23.1	50'	24.4	50'
20	16.9	50'	17.5	50'	18.2	50'	18.8	50'	20.1	50'
18	15.2	50'	15.8	50'	16.3	50'	16.9	50'	18.0	50'
16	13.1	45'	13.7	45'	14.2	45'	14.8	45'	15.9	45'
14	11.4	45'	12.0	45'	12.3	45'	12.9	45'	14.0	45'
12	9.7	45'	10.3	45'	10.6	45'	11.2	45'	12.1	45'
10	8.4	45'	8.8	45'	9.1	45'	9.7	45'	10.4	45'
8	6.9	45'	7.3	45'	7.6	45'	8.0	45'	8.9	45'

Pattern Development for

Air Conditioning Fittings*

By William Neubecker

Head Instructor

Sheet Metal Department, New York Trade School

Transitions, Rectangular to Round (By Triangulation)

IN THE two previous problems published in AMERICAN ARTISAN two types of transitions were developed. In the first problem shown, the round end of the transition was placed central, over and under the rectangular end, thus requiring a *one-quarter plan only* when developing the pattern shape, because the four quarter plans were similar. In the second problem shown, the round end was tangent at the center of the wide side of the rectangular end, thus requiring a *half plan only* when developing the pattern shape, because the two half plans were similar.

In the accompanying drawing, Fig. 37 shows another type of transition, when the round end is tangent at both the wide and narrow sides of the rectangular end as indicated in the end view; in which no two corners are alike, thus requiring that the true lengths for each of the four corners must be found, when developing the pattern shape. In this case we assume that the rectangular riser or stack to which the transition will connect will be 4×12.5 inches or 50 square inch area. To find the diameter of the round end of the transition having a similar area, refer to a table of Circumferences and Areas. Follow down the column of Areas to the figure nearest to 50 and find 50.26 which suggests an 8-inch diameter circle for the opposite end of the transition which connects to the feed duct. Now lay-out on the metal sheet the full size 4×12.5 inch rectangle and using a 4-inch radius draw the 8-inch circle to touch the side and end of the rectangle as shown in the end view at X and B respectively.

This end view then shows, in its proper position, the wide side D-A flush against the ceiling line and the narrow side A-B flush against a vertical wall. The rectangular end of the transition connects to the stack or riser by means of an elbow, and the round end of the transition connects to the round feed duct. The development of the full pattern shape is now in order.

Pattern for Transition

Having drawn the end view in its proper position as shown, draw a vertical line through the center point F intersecting the circle at 1 to 7. Now space the full circle in equal divisions as shown by the figures 1 to 12, spacing each quarter circle in similar parts, in this case,

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three. From points 1 to 4 in the circle draw lines to the corner A of the rectangle; from points 4 to 7 draw lines to the corner B; points 7 to 10 to C and 10 to 1 to D. These lines just drawn, will represent the bases of triangles to be constructed, whose altitudes will be equal to the *given length* of the transition shown by A^x-A^o in the true length diagrams to the right of the end view. It will be noticed that no side view of the transition has been drawn as this view is not at all necessary as explained in the two previous problems.

Now at right angles to the given length A^x-A^o draw the vertical lines A^x-D^x and A^o-D^o indefinitely. Measuring from the corner A in end view, take the various distances to points 1, 2, 3 and 4 and set them off in the true lengths, measuring in each instance from the corner A^x and obtain the points 2-3 and 1-4, from which lines are drawn to the apex A^o , and represent the true lengths of similar numbered lines in the end view.

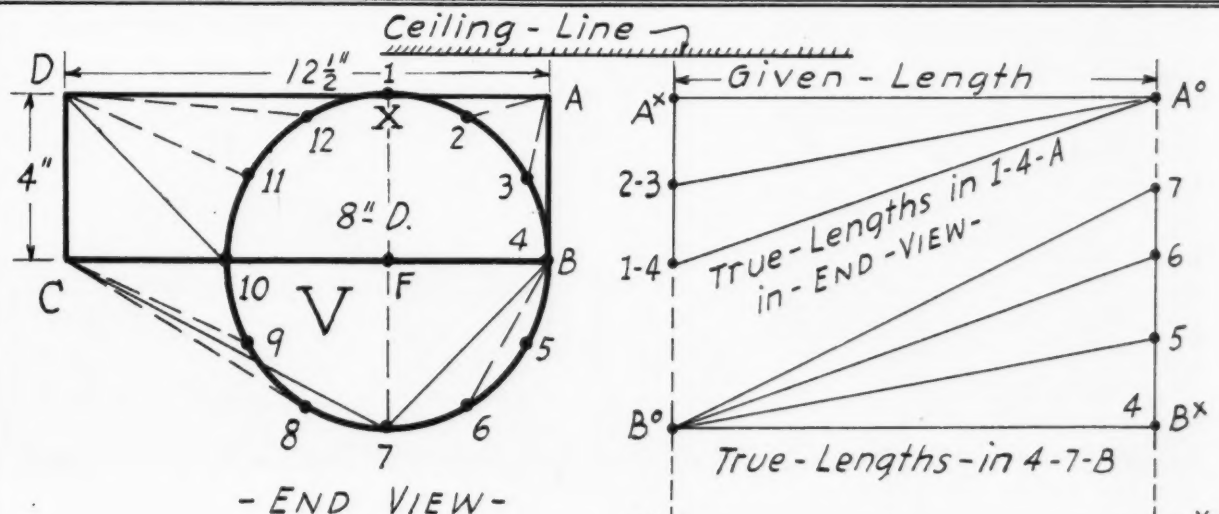
In a similar manner measuring from the corner B in end view, take the distances to points 5, 6 and 7 and set them off from the corner B^x in the true lengths and obtain intersections 5, 6 and 7, from which lines are drawn to the apex B^o resulting in the true lengths of similar numbered lines in the end view. Now measuring from the corner C in end view take the various distances to points 7, 8, 9 and 10 and from the corner D measure to points 10, 11, 12 and 1 and set them off in the true lengths from C^x and D^x respectively, thus obtaining the intersections marked 7, 8, 9 and 10 also 10, 11 12 and 1, from which points lines are drawn to the apexes C^o and D^o respectively and represent the true lengths of similar numbered lines in the end view.

In practical work all these true lengths are laid out on one triangle, but have been separated here to avoid confusion in so small a drawing. As points 1 and 4 on the circle in end view, are tangent to the wide side of the rectangle at X and to the narrow side at B respectively, then will the true length between 1 and X also between 4 and B be equal to the given length A^x-A^o and B^o-B^x respectively. The full pattern shape can now be laid out as follows:

As reference will be made a number of times to the end view, the true lengths and the pattern, these drawings have been designated V, L and P respectively.

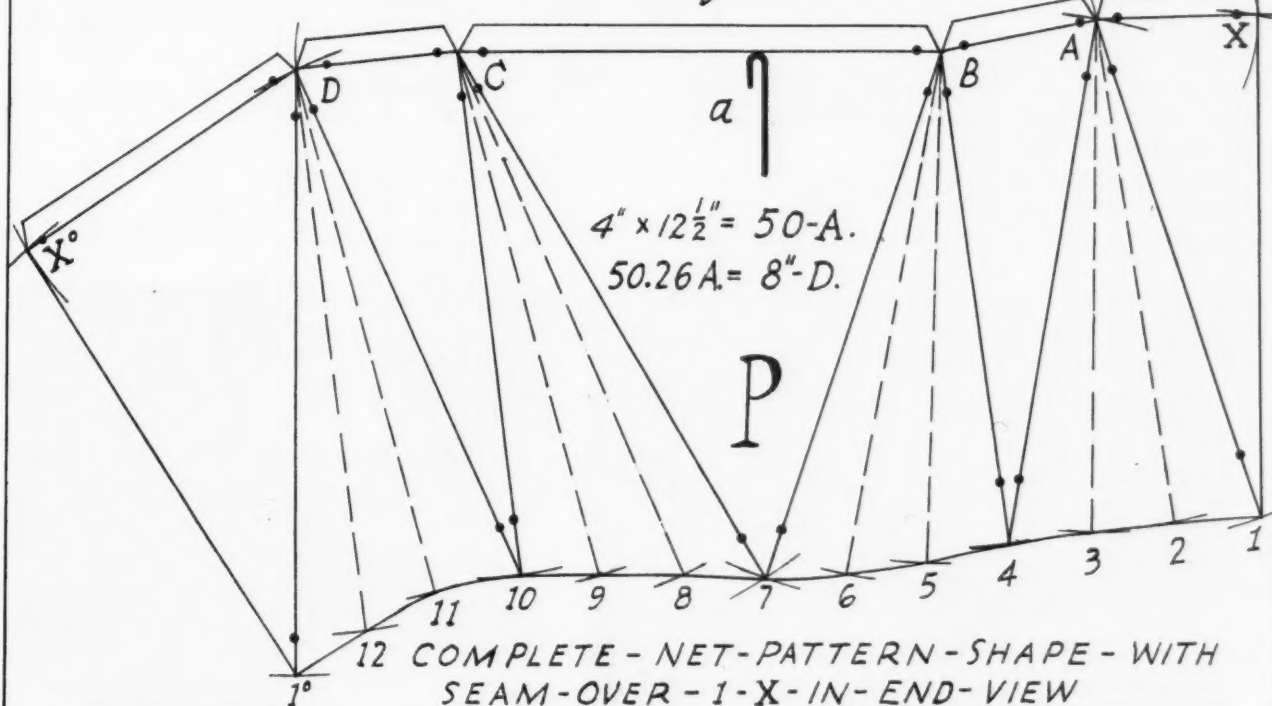
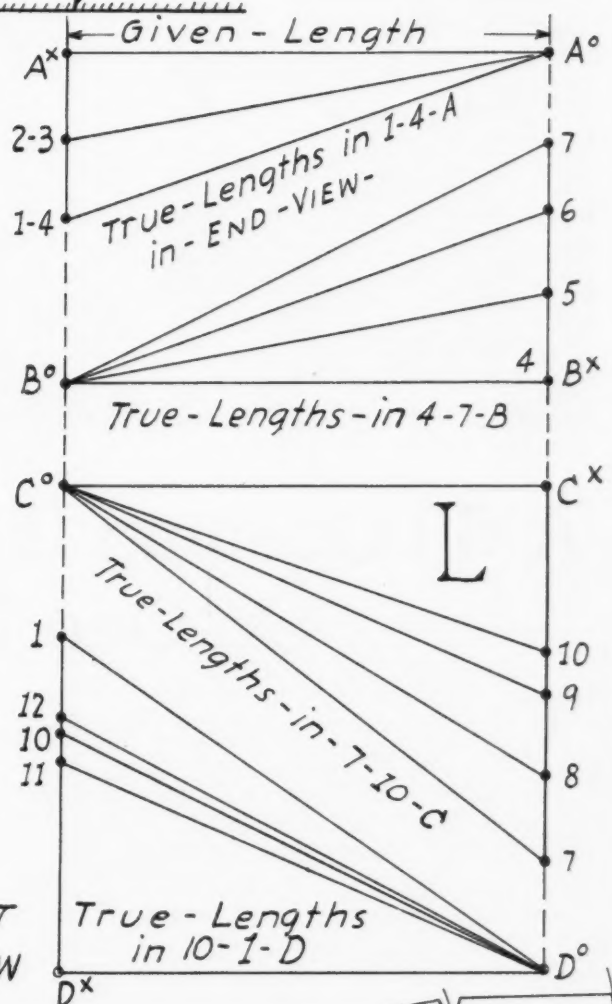
Take the distance of B-C in V and set it off on
(Continued on page 65)

PATTERN - FOR - TRANSITION - RECTANGULAR -
TO - ROUND - SOLVED - BY - TRIANGULATION (II)



NOTE: All-Base-Lines-
in-Diagrams-of-True-
Lengths-Have-Been-
Obtained-From-Similar
Numbered-Lines-In-End-View

FIG. 37- PATTERN - FOR
TRANSITION- ROUND- TO
RECTANGULAR - TANGENT
AT- 1- X- AND- 4- B- IN- END- VIEW





Left—The oil-fired, horizontal furnace with special blower-filter housing and, right—exterior of house showing the 119-foot frontage and general size of the building. Below—A section of exposed duct work in the store room and a return face on the stair landing (see second floor plan).



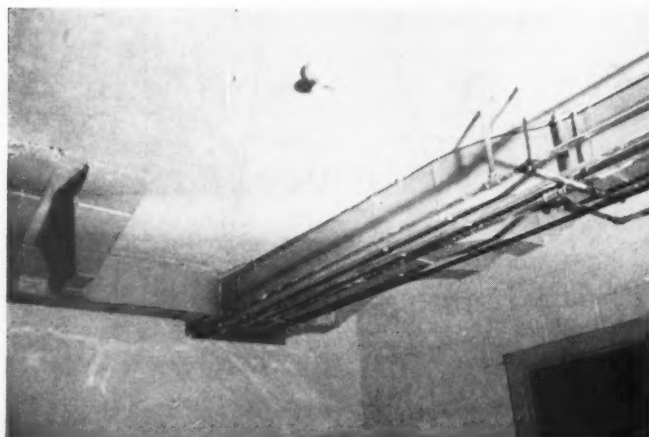
A 63-Opening Installation Balanced On One Thermostat

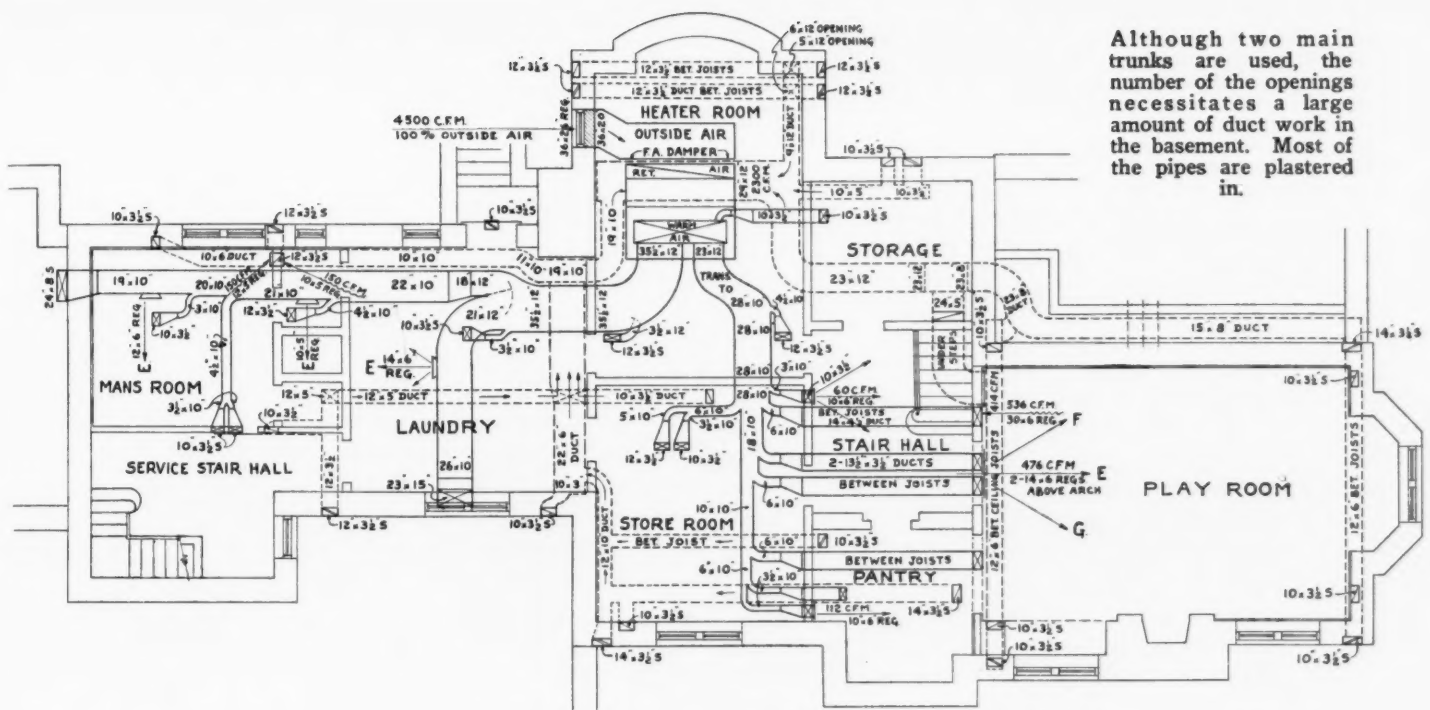
COMPARATIVE simplicity, for so large a house, characterizes the heating system in the Kansas City house shown in the layout plans and photographs. Although the house has an extended frontage (119 feet), a total heat loss of more than 300,000 Btu. and requires more than 4,500 cfm, the contractor, Hunt Brothers Sheet Metal and Heating Company, Kansas City, took full advantage of the centrally located equipment room and basement arrangement of rooms to restrict the air distribution and return systems to two supply mains and two return mains which are run through halls and service rooms. In this house 63 registers and returns were required. The installation was figured, designed, fabricated, installed, serviced and collected by Hunt Brothers.

Two interesting features of the system appear from a study of the plans. First, the entire house is temperature controlled from one thermostat located in the

first floor stair hall. Zoning for temperature control is not used; the differences in heat loss caused by varying exposures or room usage are compensated for by careful balancing of the air delivery.

The second interesting feature is the overall air distribution. In this house several basement rooms (play room, pantry or bar, chauffeur's room) have to be controlled to selected temperatures. On the first floor the living room has three exposures, the garage is heated and vented, the dining room has a large glass area. Because of small interior wall areas on both floors and numerous wall openings it was not deemed practicable to run stacks to second floor registers so all air for the second floor is taken up into the attic through one large outside wall stack and distributed through an attic duct system as shown. From bonnet to register (second floor), counting in all turns and fittings, the equivalent lengths of some runs totals





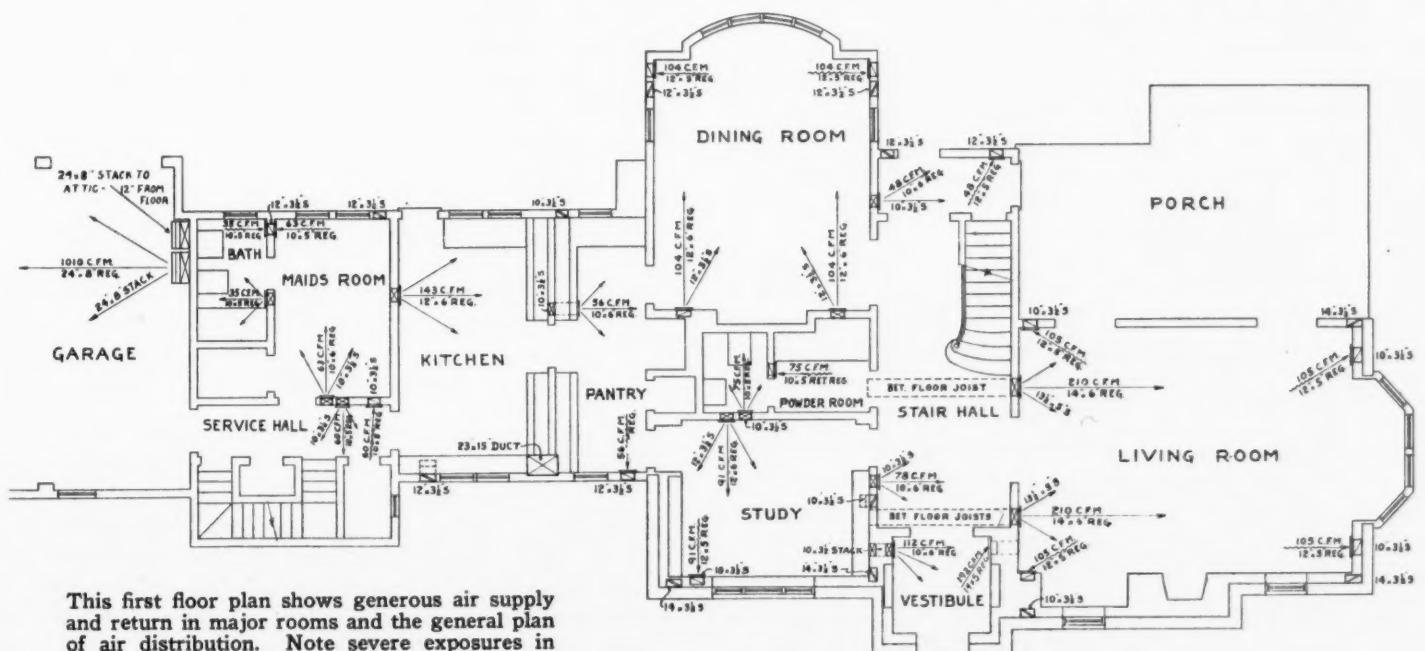
BASEMENT PLAN

above 200 feet of pipe; this length had to be considered for temperature drop and friction.

Due to the fact that temperatures throughout all rooms are controlled from one thermostat, it was essential that air distribution within rooms should be more than usually uniform. This was assured in major rooms by introducing air at two points using directional flow registers to direct the air stream to exposed wall and glass surfaces. For instance, the long living room on the first floor, the dining room, the master bed room and guest bed room on the second floor have two registers each.

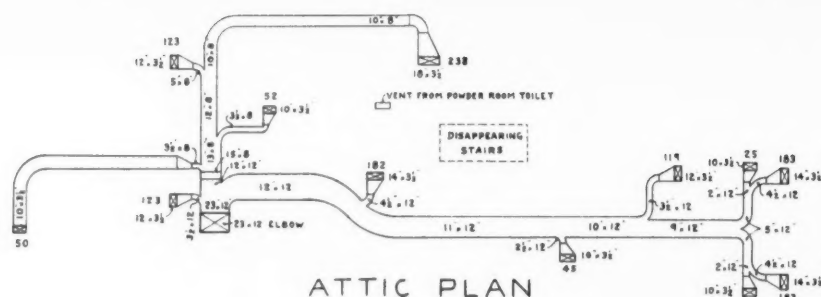
Equal care was taken to get uniform air return. Rooms having two supplies have two returns, located in outside walls where possible and sized for volumes equalling the supplies excepting in the living room where the two supplies are balanced by four returns as shown. Essential data for air volumes and face sizes are included in the plans.

Some ingenuity was required and careful planning was needed by both the heating contractor and architect, Edward B. Delk, to provide proper locations for registers and returns and to get the pipe work concealed. For example, the basement play room ceiling

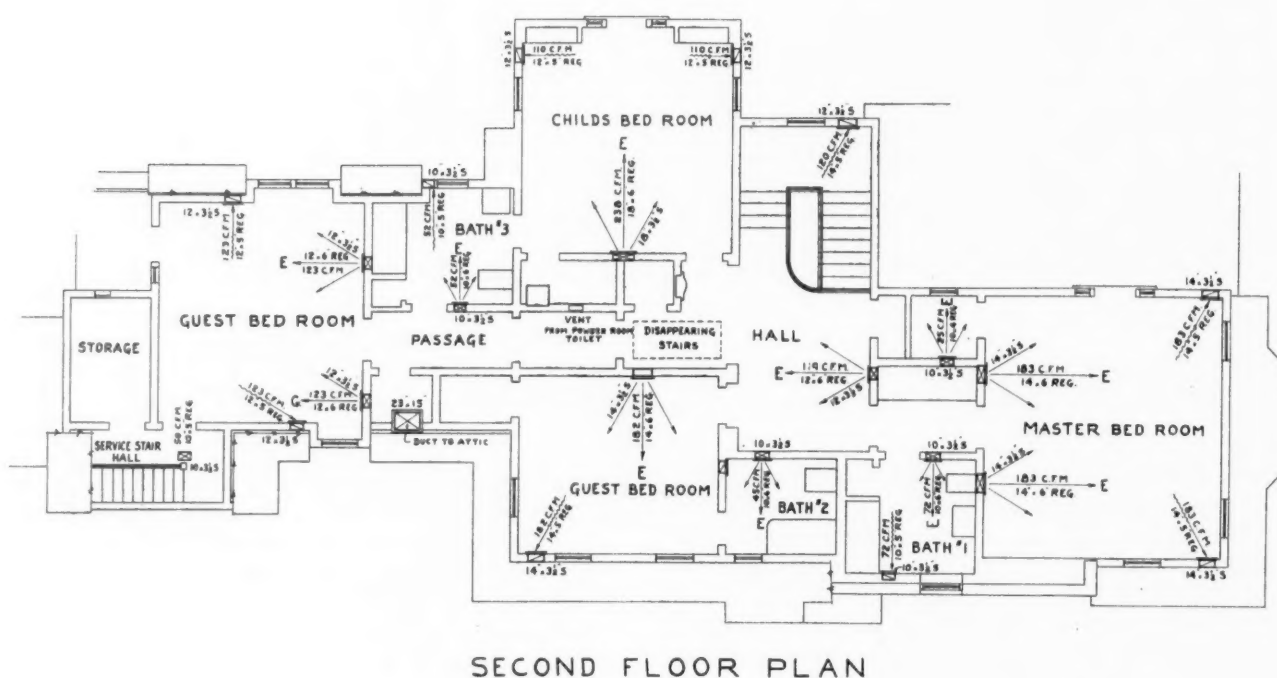


This first floor plan shows generous air supply and return in major rooms and the general plan of air distribution. Note severe exposures in living and dining rooms.

FIRST FLOOR PLAN



Second floor plan and arrangement of second floor supply piping in the attic. As on the first floor, severely exposed rooms have more than one supply or return.



joists run across the short dimension of the room. Air is introduced directionally from a double joist space through the hall and returned from an inside wall under the stairs (see basement plan), but the two outside corner returns and the two inside corner returns from the living room above had to be taken through the foundation wall into an excavated trench under the porch, past the basement stairs and brought back into the basement through another foundation wall opening. As shown on the basement plan, this outside duct is blocked inside a non-load-bearing wall and heavily insulated.

The riser which supplies the attic system comes off a generous branch at an outside wall, is concealed behind cabinets in the pantry and kitchen, is plastered in as a wall offset through the second floor hall supply closet, and runs under the roof around the outside of the attic floor leaving most of the attic head room free of pipes. All attic pipes are insulated with $\frac{1}{2}$ in. Temlok.

The Heat Loss Sheet

The heat loss sheet reproduced shows how exposures and long runs of pipe were compensated for. The design temperature difference in most rooms is 80 degrees (-10 to 70), rooms close to the furnace use register air temperatures of 130 to 135 degrees, while remote second floor rooms have cfm's based upon

register temperatures of 115 to 120 degrees—one quarter of a degree drop per foot of actual length. The garage calls for only 50 degrees temperature difference or 40 degrees above zero and a volume of air equal to the input is vented to the attic.

Heating equipment for this installation was assembled. The furnace is a small horizontal heater (cast iron) manufactured by the P. H. MaGirl Foundry & Furnace Works; two 18-inch American Blower Company housed wheels are enclosed in a specially built cabinet (see photograph); the oil burner is Petro-Nokol; humidification is by a Fox spray type unit. The photograph of the equipment shows the good looking sheet metal work fabricated by Hunt Brothers.

Changes in Layout

Although the engineer's plans which we show indicate all long, easy sweep elbows and low friction fittings, it was not possible to follow plans completely. There are a number of sections where right angled elbows had to be used, but flow characteristics were improved and friction reduced in such fittings by using "Ducturns" (Tuttle and Bailey). Splitter dampers were used at practically all branches or main pipe divisions in order to permit complete balance. All branch pipes serving registers or stacks have individual cut

NAME-MR & MRS. D. MCGREEVY CITY-KC. MO. ARCHITECT-EDWARD B. DELK CITY-KC. MO. DATE
HEATING ENGINEER-HUNT BROS. SHT METAL & HTG. CO. CITY-KANSAS CITY, MO.

ROOM DIMENSIONS	CUBICS	U=0.02		U=1.13		U=1.10		U=1.07		U=1.2		REG-TEMP		α U α				
		INFILTRATION	BTU	EXP WALL	GLASS	NET WALL	EXP FLOOR	DUCT LOSS	BTU FOR 1° F. D	BTU	BTU	DUCT LOSS	% BTU	TOTAL REAHY	CFM	SQ. INCH AREA MAIN BRANCH RISER REG.		
PLAY ROOM 23x16x8	2944	2444	59	496	75	85	421	42	390	234	✓	425	80°	34000	130°	476	2-14/6 14/5 14/5 14/5	
HALL 10x10x8	800	✓	✓	✓	✓	✓	✓	✓	100	54	✓	54	80°	4320	135	60	1-10/6 10/32 10/32 10/32	
PANTRY 12x8x8	770	770	15	120	25	28	95	10	90	48	✓	101	80°	8080	130	112	1-10/6 10/32 10/32 10/32	
MAN'S ROOM 14x12x8	1344	1344	27	208	25	28	183	18	168	90	✓	163	80°	13030	125	195	1-12/6 12/32 12/5 12/32	
MAN'S BATH 14x12x8	672	672	13	184	8	9	176	18	84	45	✓	85	90°	7650	130	111	1-10/6 10/32 10/5 10/32	
LIVING ROOM 24x17x9	3680	7360	147	585	141	160	444	44	✓	✓	✓	351	80°	28100	130	420	2-14/6 14/32 14/32 14/32	
VESTIBULE 7x5x4	315	315	63	63	28	32	35	4	✓	✓	✓	99	80°	7920	130	112	1-10/6 10/32 10/5 10/32	
HALL 9x19x9	1665	3330	67	81	✓	✓	81	8	✓	✓	✓	75	80°	6000	135	78	1-10/6 10/32 10/5 12/32	
STUDY 15x10x9	1430	1430	29	190	35	40	155	16	✓	✓	✓	85	80°	6800	135	91	1-12/6 12/32 12/5 12/32	
PANTRY 7x17x9	1072	1072	21	108	20	23	88	9	✓	✓	✓	53	80°	4250	135	56	1-10/6 10/32 10/5 12/32	
KITCHEN 11x17x9	1730	3460	69	198	48	54	150	15	✓	✓	✓	138	80°	11050	135	143	1-12/6 12/32 EXHAUST	
GARAGE 30x22x9	5940	29700	594	736	225	254	513	51	330	353	640	80	1328	50°	66400	125	1010	1-24/8 24/8 EXHAUST
MAIDS ROOM 9x12x8	960	960	19	72	25	28	47	5	24	3	✓	55	80°	4400	130	63	1-10/6 10/32 10/5 10/32	
MAIDS BATH 9x5x9	382	382	7	45	13	15	32	3	43	5	✓	30	80°	2400	125	35	1-10/5 10/32 10/5 10/32	
DINING ROOM 13x17x9	2375	4750	95	225	80	90	145	15	✓	✓	✓	200	80°	16000	135	208	2-12/6 12/32 12/5 12/32	
ENTRY 9x3x9	256	256	5	108	23	26	85	9	✓	✓	✓	40	80°	3200	130	48	1-10/6 10/32 10/5 12/32	
MASTER BED 17x17x8	2448	4896	98	473	66	75	407	41	306	37	✓	251	80°	20300	115	366	2-14/6 14/32 14/5 14/32	
#1 BATH 9x7x8	532	532	11	85	12	14	73	7	67	8	✓	40	90°	3600	115	72	1-10/6 10/32 10/5 10/32	
#1 GUEST BED 13x12x8	1550	2325	47	176	45	51	131	13	194	23	✓	134	80°	10730	120	182	1-14/6 14/32 14/5 14/32	
TOTAL														258230				

#2 BATH 7'-6" x 8'	364	364	8	56	8	9	48	5	✓	46	6	✓	28	90°	2520	115	45	1-	10/6	10/5	10/5	10/5							
#2 GUEST BED 15'-16" x 8'	1920	3860	77	304	66	75			✓	240	28	✓	204	80°	16320	125	246	2-	12/6	12/5	12/5	12/5							
#3 BATH 9'-7" x 8'	501	538	11	72	10	11	62	6	✓	63	7	✓	35	90°	3150	125	52	1-	10/6	10/5	10/5	10/5							
CHILD'S BED 13'-15" x 8'	1864	2796	56	280	60	68	220	22	✓	234	28	✓	174	80°	13920	120	238	1-	14/6	14/5	14/5	14/5							
HALL 10'-21" x 8'	1680	1680	34	80	15	17	65	7	✓	210	25	✓	83	80°	6640	120	TOTAL 2ND FL 119	1-	12/6	12/5	12/5	12/5							
	37204														300,780		C.F.M. 4538												

off dampers further to assist in balancing. Although the plans reproduced do not show them, practically every partition is filled with wiring, plumbing pipes, soil pipes and so forth, accordingly after the stacks were roughed in the actual shop measurements were

made on the job using outside and partition walls as base lines. Every trunk and branch was laid out in the shop to these measurements, then divided into sections and fittings; these were numbered for field assembly.

Neubecker Pattern

(Continued from page 60)

the horizontal line as shown by B-C in P. With radius equal to B°-7 in L and using B in P as center draw a short arc near 7, which intersect by an arc struck from C as center, with C°-7 in L as radius. Draw lines in P, from B to 7 to C. Now with radii equal to B°-6, 5 and 4 in L and with B in P as center, draw short arcs near 6, 5 and 4. Set the dividers equal to the spaces between 7 and 4 in V and starting from 7 in P step to arcs 6, 5 and 4 and draw a line from 4 to B. With B-A in V as radius and B in P as center, draw a short arc near A and intersect it by an arc struck from 4 as center, with a radius equal to A°-4 in L. Draw lines in P from 4 to A to B. With radii equal to A°-3, 2 and 1 in L and A in P as center draw short arcs near 3-2 and 1.

Set the dividers equal to the divisions between 4 and 1 in V and starting from 4 in P step to arcs 3-2 and 1 and draw a line from 1 to A. With A-X in V as radius and A in P as center, draw an arc near X and intersect it by an arc struck from 1 as center, with a radius equal to the given length A°-A* in L. Draw lines in P from A to X to 1. Now with radii equal to C°-8, 9 and 10 in L and using C in P as center, draw short arcs near 8, 9 and 10. Again set the dividers equal to the divisions between 7 and 10 in V and starting from point

7 in P step to arcs 8, 9 and 10 and draw a line from 10 to C. With C-D in V as radius and C in P as center, draw the short arc D and intersect it by an arc struck from 10 as center with a radius equal to D°-10, in L.

Draw lines in P from C to D to 10. Using radii equal to D°-11, 12 and 1 in L and with D in P as center, draw short arcs near 11, 12 and 1°. Set the dividers equal to the divisions between 10 and 1 in V and step them off from 10 in P to arcs 11-12 and 1°. Draw a line from 1° to D. Take the distance D-X in V as a radius and using D in P as center, draw a short arc near X° which intersect by an arc struck from 1° as center with a radius equal to the given length A°-A* in L, which, of course, will be similar to 1-X in P. Draw lines from 1° to X° to D.

Through intersections from 1 to 7 to 1° in the pattern shape, trace the irregular curved line, to which edges must be added for seaming onto the collar of the round end of the transition. Along the upper edges of the pattern shape from X to X° locks are allowed as shown, which are turned outward in practice as indicated by the section a for drive cleat connection to the curved elbow, connecting to the riser or stack as previously mentioned. Along X°-1° and X-1 in the pattern shape, locks must be allowed for grooving, providing the transition is made up in one piece. The heavy dots shown on the pattern indicate where slight bends must be made when forming up the transition.

Precalculated Engineering

In the early articles of this series the assumption was made that all registers within a given house show the same register air temperature. In the January article, the author explained that register air temperatures vary according to the distance between bonnet and register, basement air temperature, and initial duct temperature. The January temperatures were not precisely calculated. For those who want a more precise method of calculating register air temperatures, this article, with formulas, is written.

By G. A. Voorhees

THROUGHOUT this series of articles, the basic idea has been, not to present any one method and say "This is best," but rather to show *how* certain practical tables have been worked out and to explain the methods by which they were calculated, with the idea of suggesting to the reader how he can make up his own tables to meet his own requirements.

In the last preceding article, it was pointed out that there is no general agreement among experienced engineers and contractors who have specialized in the design and installation of mechanical warm air systems, as to the "best" bonnet temperature to use as a design basis; nor is there any similar agreement as to the "correct" rate of duct temperature drop to assume in arriving at register air temperatures after the bonnet temperature is established. That article described *one* of several methods that can be used for preparing a set of tables to meet practical design conditions. Register temperatures for warm air outlets at various distances from the bonnet were established according to a certain formula—but any other formula or rule that a designer might prefer, could be similarly applied to determine air supply temperatures for his own use. Other formulas were given for estimating velocities in risers, branches and trunk lines, depending upon the length of the run from the bonnet to register, but here, again, the plant designer could just as well use any other basis which he prefers.

Tables 25 to 29 inclusive (January, 1939) were calculated from the arbitrarily chosen formulas and those tables were offered as a *suggested* design basis which a number of heating contractors and engineers have found to work out well in practice.

After examining and trying out those tables, the thoughtful reader has perhaps seen where he could improve the process as applied to his own work, by compiling similar tables of duct areas based on—

- (a) a different method of determining register temperatures
- (b) a different system for estimating air velocities in ducts

For arriving at the register temperatures of the vari-

ous rooms of a given building, several methods are used:

1. The same register temperature may be assumed for all rooms and in a small, compact house where supply ducts are short and especially where all such ducts are about the same length, this method is satisfactory.

2. Register air temperatures for the various rooms may be arbitrarily set by the designer. He may say, for instance "These three rooms close to the furnace will have register temperatures of about 145 degrees; here are two more rooms a little further away where the register temperatures will be about 140°; then those last three rooms which have quite long runs had better have their ducts sized for a register temperature of 135 degrees." For the experienced designer there's no objection to this method, but the beginner had better not rely wholly on his judgment in such matters; there's too much chance for error.

3. The register temperature for each room may be based on (a) a definite air temperature in the furnace bonnet and (b) an assumed or calculated rate of air temperature drop in the supply duct system per foot of duct length between bonnet and register. This is the basically correct method and is the one which will be considered here.

There is a fourth method introduced several years ago by Mr. J. Earl Maynard in a manual prepared for dealers, whereby the same register temperature is assumed for all rooms regardless of distance from the furnace; then after the cfm requirements for all rooms have been determined on the basis of the fixed register temperature, these air delivery volumes are adjusted by applying a percentage correction based on the length of run. This procedure, which is a combination of methods 1 and 3 listed above, has manifest advantages, but it will not be considered here because our present purpose is to establish a *basic* method for determining cfm capacities.

Considering the third method listed, the first question is: How shall bonnet temperature be determined? Next: What rate of temperature drop should be used?

There's no universally accepted answer to either.

Some designers assume a fixed bonnet temperature for all jobs. Others vary the bonnet temperature arbitrarily, depending on the size of the building. They argue rightly, that in larger houses, the ducts are longer and that therefore higher bonnet temperatures must be maintained to avoid undesirably low register temperatures in remote rooms.

While both of the foregoing methods are widely used, and give satisfactory results when applied with sound judgment, the logically correct method is to start with some certain *average* register temperature which seems to best fit the job in question, and let it determine the bonnet temperature.

Average vs. Actual Reg. Temp.

For our present purpose, it will be assumed that by calculation or otherwise, the *average* register air temperature for a given job has been determined, and we turn next to a consideration of the relation between this average register temperature and the specific register temperature of each room, which is to be used as a basis for determining the cfm requirement and the duct size of that room.

To conform to the Technical Mechanical Heating Code, the *average register temperature* of a plant may be defined as "the bonnet temperature minus one-half of the difference between bonnet temperature and register temperature at most remote register." See Art. 6, Section 2 (d), Second Edition.

Referring to Fig. 1:

Bonnet temperature 163 deg.
Register temperature at most remote register. 127 deg.

Maximum temperature drop (difference between bonnet temperature and register temperature at most remote register) is, by subtraction 36 deg.

Average register temperature = $163 - \frac{36}{2}$... 145 deg.

In the 80-foot run from furnace to Register No. 1, the temperature drop is $163 - 127 = 36$ degrees and the *rate* is therefore $36 \text{ deg.} \div 80 \text{ ft.} = 0.45$ degree per foot.

It is quite commonly *assumed* that the rate of temperature drop is uniform throughout the length of a given duct. If this assumption were correct and if the point *x* (Fig. 1) is 10 feet from the bonnet and the point *y* is 10 feet from Register No. 1, then the number of degrees of temperature drop between the furnace bonnet and *x*, and between *y* and the register, would each be $10 \times 0.45 = 4.5$ degrees.

Therefore the air temperature within the duct at *x*

would be $163 - 4.5 = 158.5$ degrees, and the duct air temperature at *y* would be $127 + 4.5 = 131.5$ degrees. Actually, a test would show the temperature at *x* to be less than 158.5 degrees and at *y* to be higher than 131.5 degrees.

The common assumption of a *uniform* rate of temperature drop throughout the length of a given duct, breaks down in practice because such temperature drop is due to loss of heat by transmission through the duct walls to the surrounding basement air and, like the more familiar case of heat transmission loss through the exposed walls of a room, it varies directly as the *difference* between the inside and outside temperatures. If the basement air temperature is the same throughout, the *difference* between duct air temperature and basement air is greater near the furnace where the air in the duct is hotter.

Granted that this variation in the rate of temperature drop actually exists, it is the practice of many designers to ignore it and to assume for convenience, that *on a given job* the rate of temperature drop is uniform throughout the length of the duct system.

But for *different* jobs, *different* rates might be assumed. Thus a plant installed in a building where the supply ducts run through heated basement rooms, would have a lower rate of temperature drop than one in a house with a poor foundation and with the ducts running through cold, unexcavated spaces.

Even though it is permissible, in practice, to assume a uniform rate of temperature drop in the supply ducts of a given plant, it is important to keep in mind that, other things being equal, *a plant having a high bonnet temperature will tend to have a higher rate of temperature drop per foot of duct*, than a plant with a lower bonnet temperature.

A Suggested Reg. Temp. Formula

In the absence of more precise data on temperature drop and to avoid use of formulas which are too complicated to be practical for the average job, the writer *suggests* a rate of temperature drop based on the empirical formula:

$$R = 0.005 \times (T_b - 70) \quad (1)$$

in which

R = rate of temperature drop, degrees F. per foot of duct length

T_b = bonnet air temperature, degrees F.

This formula is *not mathematically correct*, but several engineers who have used it in practical design, report that it gives satisfactory results.

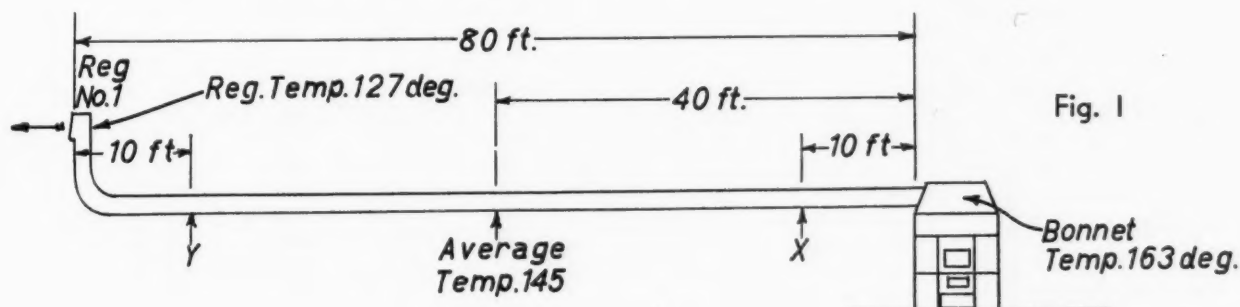


Fig. 1

If it is accepted as suitable, it provides a rational basis for assigning a definite design register temperature to each room as is indicated by the following equations, provided the average register temperature for the job has been established.

The bonnet temperature is found from the formula:

$$T_b = T_a + (R \times L_a) \dots\dots\dots (2)$$

in which

T_b = bonnet temperature, degrees F.

T_a = average register temperature

L_a = "average length" of supply duct system in feet = one-half of the distance in feet, measured along the duct, from the bonnet to the most remote register

Substituting in (2), the value of R in (1)

$$T_b = T_a + [0.005 \times (T_b - 70) \times L_a]$$

$$= T_a + (0.005 \times T_b \times L_a) - (0.35 \times L_a)$$

Transposing:

$$T_b - (0.005 \times T_b \times L_a) = T_a - (0.35 \times L_a)$$

Whence:

$$T_b \times [1 - (0.005 \times L_a)] = T_a - (0.35 \times L_a)$$

$$T_b = \frac{T_a - (0.35 \times L_a)}{1 - (0.005 \times L_a)} \dots\dots\dots (3)$$

Assume that an average register of 140 degrees is wanted, and that the length of the longest warm air duct is 60 feet. Since the average length of duct is taken as one-half of the length of the longest duct, it is for this problem, one-half of 60 or 30 feet. By substituting the known values in formula (3) the bonnet temperature is found:

$$T_b = \frac{140 - (0.35 \times 30)}{1 - (0.005 \times 30)}$$

= 152 degrees, bonnet temperature

The register temperature at any register will be:

$$T_r = T_b - (R \times L) \dots\dots\dots (4)$$

in which

T_r = register air temperature at any register

L = length of duct in feet, from furnace bonnet to the register

Substituting in (4) the value of R expressed in (1) and of T_b expressed in (3) and simplifying:

$$T_r = \frac{T_a - (0.35 \times L_a)}{1 - (0.005 \times L_a)} - [0.005 \times (T_b - 70) \times L]$$

$$= \frac{[T_a - (0.35 \times L_a)] \times [1 - (0.005 \times L)]}{1 - (0.005 \times L_a)} +$$

$$(0.35 \times L) \dots\dots\dots (5)$$

From this formula (5), the register air temperature in Tables 30 to 38 inclusive, are calculated to the nearest five degrees. For example, if the average register temperature is 135 degrees and the length of the longest warm air run is 70 feet from bonnet to register, the average length of run is 35 feet and by substituting 135 for T_a and 35 for L_a , the formula becomes:

$$T_r = \frac{[135 - (0.35 \times 35)] \times [1 - (0.005 \times L)]}{1 - (0.005 \times 35)} + 0.35 L$$

$$= \frac{122.75 \times [1 - (0.005 \times L)]}{0.835} + (0.35 \times L)$$

$$= 148.79 - (148.79 \times 0.005 \times L) + (0.35 \times L)$$

$$= 148.79 - (0.39 \times L)$$

Starting with the air temperature at the bonnet where $L = 0$, and where T_r therefore represents the bonnet temperature, T_b ,

$$T_r = 148.79 - 0$$

$$= 148.79$$

$$= 150 \text{ to the nearest 5 degrees}$$

Taking the other extreme and assuming a register 70 feet from the bonnet, $L = 70$ and the corresponding temperature at this register is, by substitution in formula (5)

$$T_r = \frac{[135 - (0.35 \times 35)] \times [1 - (0.005 \times 70)]}{1 - (0.005 \times 35)} +$$

$$(0.35 \times 70)$$

$$= 121$$

$$= 120 \text{ to nearest 5 degrees.}$$

The first table of register air temperatures is shown below. The following two pages contain eight additional tables for "average" register air temperatures up to 160 degrees.

TABLE 30
Average Register Temperature 120 Deg.

	Actual Length of Longest Warm Air Duct, Feet						
	20	30	40	50	60	70	80
Bonnet temperature	125	125	125	125	130	130	130
Length of duct from bonnet to register							
10 ft.	120	120	125	125	125	125	130
20 ft.	115	120	120	120	125	125	130
30 ft.		115	115	120	120	120	125
40 ft.			115	115	115	120	120
50 ft.				115	115	115	120
60 ft.					110	115	115
70 ft.						110	110
80 ft.							110
90 ft.							105

TABLE 31

Average Register Temperature, 125 Deg.

Bonnet temperature	Actual Length of Longest Warm Air Duct, Feet									
	20	30	40	50	60	70	80	90	100	110
Length of duct from bonnet to register	130	130	130	135	135	135	140	140	145	145
Register Air Temperature	125	125	130	130	130	135	135	135	140	140
	120	125	125	130	130	130	130	135	135	140
	120	120	120	125	125	125	130	130	135	135
	120	120	120	120	120	120	125	125	125	125
	115	120	120	120	120	120	120	120	120	120
	115	115	115	115	115	115	115	115	115	115
	115	115	115	115	115	115	115	115	115	115
	110	110	110	110	110	110	110	110	110	110
	105	105	105	105	105	105	105	105	105	105
	110	110	110	110	110	110	110	110	110	110

TABLE 33

Average Register Temperature, 135 Deg.

Bonnet temperature	Actual Length of Longest Warm Air Duct, Feet									
	20	30	40	50	60	70	80	90	100	110
Length of duct from bonnet to register	140	140	140	145	145	150	150	155	160	165
Register Air Temperature	135	135	140	140	140	145	145	150	155	160
	130	135	135	140	140	140	145	145	150	155
	130	130	130	135	135	140	140	145	145	150
	130	130	130	130	130	135	135	140	140	145
	125	130	130	130	130	130	130	135	135	140
	125	125	125	125	125	125	125	130	135	135
	125	125	125	125	125	125	125	125	130	130
	120	120	120	120	120	120	120	120	125	125
	115	115	115	115	115	115	115	115	115	115
	110	110	110	110	110	110	110	110	110	110

TABLE 32

Average Register Temperature, 130 Deg.

Bonnet temperature	Actual Length of Longest Warm Air Duct, Feet									
	20	30	40	50	60	70	80	90	100	110
Length of duct from bonnet to register	135	135	135	140	140	140	145	145	150	155
Register Air Temperature	130	130	135	135	135	140	140	145	150	150
	125	130	130	130	130	135	135	140	145	145
	125	125	125	130	130	130	135	135	140	145
	125	125	125	125	125	130	130	135	135	140
	120	120	120	120	120	125	125	130	130	135
	120	120	120	120	120	120	125	125	130	130
	120	120	120	120	120	120	120	120	125	125
	115	115	115	115	115	115	115	115	115	115
	110	110	110	110	110	110	110	110	110	110
	105	105	105	105	105	105	105	105	105	105

TABLE 34

Average Register Temperature, 140 Deg.

Bonnet temperature	Actual Length of Longest Warm Air Duct, Feet									
	20	30	40	50	60	70	80	90	100	110
Length of duct from bonnet to register	145	145	150	150	150	155	155	160	165	170
Register Air Temperature	140	140	145	145	150	150	155	155	160	165
	135	140	140	140	145	145	150	150	155	160
	135	135	135	140	140	140	145	145	150	155
	130	130	130	135	135	140	140	140	145	150
	130	130	130	130	130	135	135	140	140	145
	130	130	130	130	130	130	130	135	140	140
	130	130	130	130	130	130	130	130	135	140
	125	125	125	125	125	125	125	125	130	135
	125	125	125	125	125	125	125	125	125	125
	115	115	115	115	115	115	115	115	115	115

TABLE 35

Average Register Temperature, 145 Deg.

Bonnet temperature Length of duct from bonnet to register	Actual Length of Longest Warm Air Duct, Feet										
	20	30	40	50	60	70	80	90	100	110	120
10 ft.	145	145	150	155	160	165	170	175	180	185	190
20 ft.	145	145	150	155	160	165	170	175	180	185	190
30 ft.	140	140	145	150	155	160	165	170	175	180	185
40 ft.	135	135	140	145	150	155	160	165	170	175	180
50 ft.	135	135	140	145	150	155	160	165	170	175	180
60 ft.	130	130	135	140	145	150	155	160	165	170	175
70 ft.	130	130	135	140	145	150	155	160	165	170	175
80 ft.	125	125	130	135	140	145	150	155	160	165	170
90 ft.	125	125	130	135	140	145	150	155	160	165	170
100 ft.	125	125	130	135	140	145	150	155	160	165	170
110 ft.	120	120	125	130	135	140	145	150	155	160	165
120 ft.	115	115	120	125	130	135	140	145	150	155	160

TABLE 37

Average Register Temperature, 155 Deg.

Bonnet temperature Length of duct from bonnet to register	Actual Length of Longest Warm Air Duct, Feet										
	20	30	40	50	60	70	80	90	100	110	120
10 ft.	155	155	160	165	170	175	180	185	190	195	200
20 ft.	155	155	160	165	170	175	180	185	190	195	200
30 ft.	150	150	155	160	165	170	175	180	185	190	195
40 ft.	145	145	150	155	160	165	170	175	180	185	190
50 ft.	145	145	150	155	160	165	170	175	180	185	190
60 ft.	140	140	145	150	155	160	165	170	175	180	185
70 ft.	140	140	145	150	155	160	165	170	175	180	185
80 ft.	135	135	140	145	150	155	160	165	170	175	180
90 ft.	135	135	140	145	150	155	160	165	170	175	180
100 ft.	130	130	135	140	145	150	155	160	165	170	175
110 ft.	125	125	130	135	140	145	150	155	160	165	170
120 ft.	120	120	125	130	135	140	145	150	155	160	165

TABLE 36

Average Register Temperature, 150 Deg.

Bonnet temperature Length of duct from bonnet to register	Actual Length of Longest Warm Air Duct, Feet										
	20	30	40	50	60	70	80	90	100	110	120
10 ft.	150	150	155	160	165	170	175	180	185	190	195
20 ft.	150	150	155	160	165	170	175	180	185	190	195
30 ft.	145	145	150	155	160	165	170	175	180	185	190
40 ft.	140	140	145	150	155	160	165	170	175	180	185
50 ft.	140	140	145	150	155	160	165	170	175	180	185
60 ft.	135	135	140	145	150	155	160	165	170	175	180
70 ft.	135	135	140	145	150	155	160	165	170	175	180
80 ft.	130	130	135	140	145	150	155	160	165	170	175
90 ft.	130	130	135	140	145	150	155	160	165	170	175
100 ft.	125	125	130	135	140	145	150	155	160	165	170
110 ft.	120	120	125	130	135	140	145	150	155	160	165
120 ft.	115	115	120	125	130	135	140	145	150	155	160

TABLE 38

Average Register Temperature, 160 Deg.

Bonnet temperature Length of duct from bonnet to register	Actual Length of Longest Warm Air Duct, Feet										
	20	30	40	50	60	70	80	90	100	110	120
10 ft.	160	160	165	170	175	180	185	190	195	200	205
20 ft.	160	160	165	170	175	180	185	190	195	200	205
30 ft.	155	155	160	165	170	175	180	185	190	195	200
40 ft.	150	150	155	160	165	170	175	180	185	190	195
50 ft.	145	145	150	155	160	165	170	175	180	185	190
60 ft.	145	145	150	155	160	165	170	175	180	185	190
70 ft.	140	140	145	150	155	160	165	170	175	180	185
80 ft.	140	140	145	150	155	160	165	170	175	180	185
90 ft.	135	135	140	145	150	155	160	165	170	175	180
100 ft.	135	135	140	145	150	155	160	165	170	175	180
110 ft.	130	130	135	140	145	150	155	160	165	170	175
120 ft.	125	125	130	135	140	145	150	155	160	165	170

*The Announcement that Revolutionizes
the Oil Burner Industry*

ALDRICH *Sav-Haf* OIL BURNER and FUEL CHANGER for NO. 5 OIL (NOT JUST A "PRE-HEATER")



As equipped
for No.
2 or 3 oil.

Because this newest product of "The Old Master"—Mr. Lloyd I. Aldrich—successfully burns No. 5 oil down to one gallon per hour (and up to 19) (and also burns No. 2 or 3 oil!!) it obsoletes every other burner now on the market.

Because it saves half on fuel costs, it opens up new markets. Because of its exclusive, patent-applied-for features, it enables dealers to sell at a PROFIT and really make money once more. And it puts the man who sells it in a class by himself, because

"IT HAS EVERYTHING — EXCEPT COMPETITION."

for
NO. 5 OIL
BURNS NO. 2
OR 3 TOO!

HERE ARE THE AMAZING "SAV-HAF" FACTS!

There is no fuel unit!

No conventional dead-end nozzle line . . . Impossible for nozzle to drip or carbonize . . . Nozzle never needs cleaning . . . Burns ANY fuel with less servicing . . . Uses high-pressure atomization . . . Can be installed for No. 2 or 3 oil and then "converted" easily when No. 5 oil is available . . . Adaptable to jobs of every size . . . Earns its name by what it does with No. 5 oil.

Offers a great replacement market because of its fuel-saving . . . and competes directly with stoker-heat . . . makes gas "too expensive."

We expect 1000 replies from this announcement . . . we'll be swamped with orders . . . better act FAST!



Dealers!

Here is Opportunity!

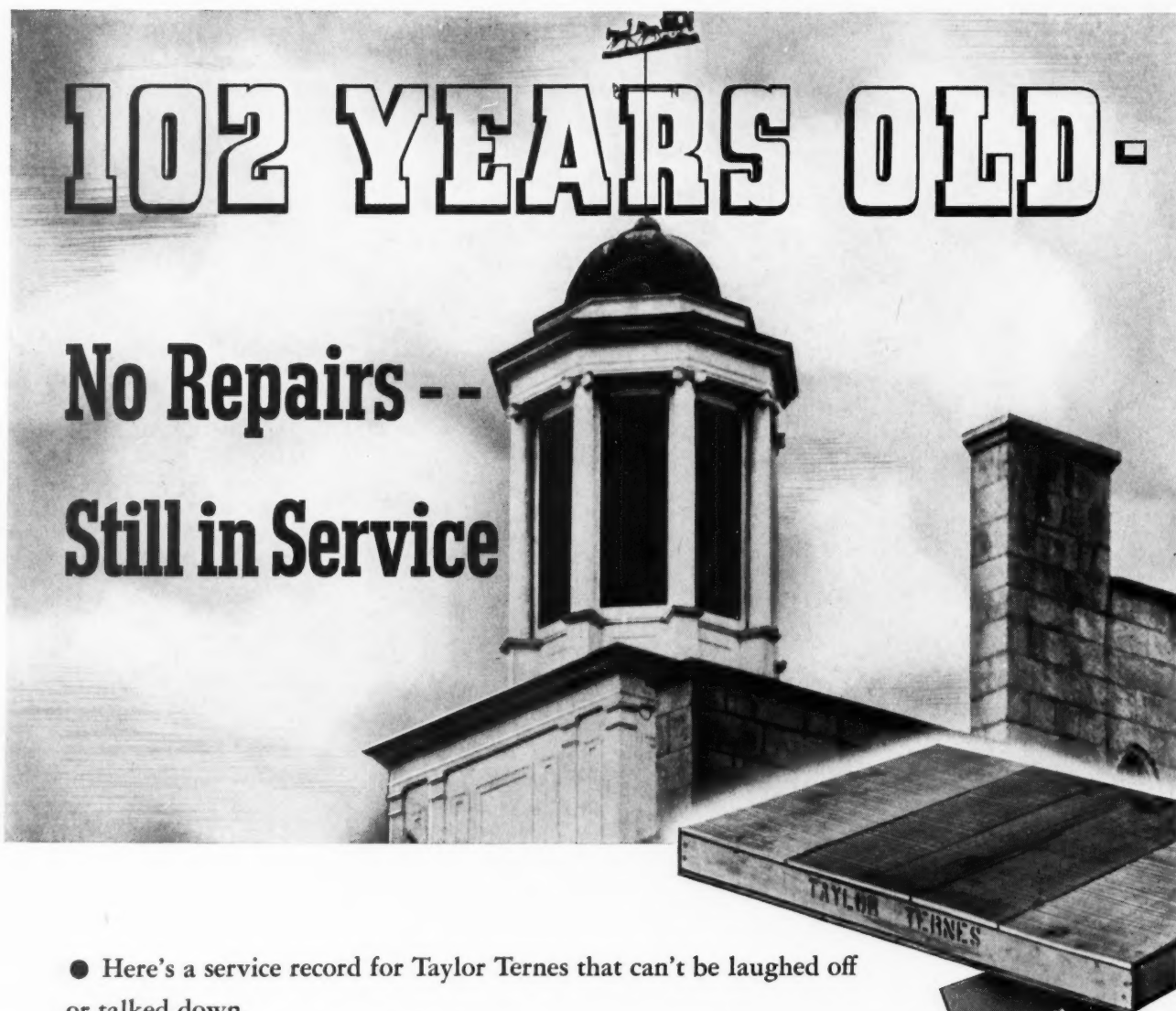
Get away from ruinous price competition of ordinary burners. Wire, phone or write TODAY. Exclusive territories given to SELECTED dealers in each locality. Sell the ALDRICH line at \$9!

ALDRICH COMPANY
PEORIA, ILLINOIS

ALDRICH COMPANY: Peoria, Ill.
RUSH details about your "SAV-HAF"
dealership. (Sign or clip to
your letterhead.)

102 YEARS OLD-

No Repairs -- Still in Service



● Here's a service record for Taylor Ternes that can't be laughed off or talked down.

When the court-house in Wellsboro, Tioga County, Pennsylvania, was built in 1835, the dome was sheathed with Taylor tin roofing. According to the records, no repairs have been made but it has been kept painted, and at the time it was last investigated in 1937, it was still intact.

The name Taylor on any of the five named brands of ternes means a durable, low first cost, low maintenance, incombustible and weather-proof roof suitable for practically every type of structure. Available in sheets and rolls — and still made according to the same basic principles that started this product on the road to popularity in 1810.

Literature will be sent on request.

REPUBLIC STEEL CORPORATION

General Offices: Cleveland, Ohio



TAYLOR ROOFING TERNES

8 lb.

BAXON

15 lb.

AVALON

20 lb.
25 lb.
30 lb.
40 lb.

OLD METHOD

40 lb.

TAYLOR
EXTRA COATED

Special

TARGET
AND
ARROW

Indiana Contractors "Go to School"

For Two-Day Convention

THE Twentieth Annual Convention of the Sheet Metal and Warm-Air Heating Contractors Association of Indiana was held Friday and Saturday, February 3rd and 4th at the Fowler Hotel in Lafayette, Indiana. Meetings and exhibits were all held in the main ballroom of the hotel.

Under the sponsorship of Purdue University a large portion of the program was conducted by university staff members. Professor W. P. Miller discussing "Ventilation for Comfort" drew comparisons between the human body and various machines in order to visualize more completely the importance of comfort ventilation.

Comparing the heart with a fuel pump, he showed the vital importance of continuous circulation both in an air ventilating system and in the human body. He stated that the body is a complete heating, air conditioning and ventilating plant, but, although the body performs all functions of air conditioning by excellent circulation and performance, the body is, in itself, only about 20% efficient mechanically. Professor Miller stated further that it has only been in the last ten years or so that comfort cooling by means of forced air circulation has become popular.

Attic Ventilation

Carrying ventilation for comfort to its logical application Professor Miller introduced attic ventilation, stressing the fact that in attic ventilation an important factor is the heat load built up by rays from the sun which, heating on the roof of a house, create a terrific heat inside the attic, sometimes as high as 178 degrees. Professor Miller showed how it is possible, with proper ventilation, to reduce the inside temperature of an attic in 20 to 30 minutes by exhausting the air from the attic alone. It is not necessary to ventilate the entire house to insure proper air movement according to Professor Miller, who showed that air will come in any opening and declared that repeated tests at the university showed that a minimum of twenty air changes per hour was necessary for comfort.

He pointed out, also, that attic ventilation has some drawbacks . . . chief of which is the failure of some systems to provide air circulation without bringing in dirt from the outside. Some discussion of the practicability of filters for air inlets was permitted, but Professor Miller pointed out that the added power consumption needed to draw the air through the filters would make the whole system expensive to operate.

Another drawback to attic cooling might be the inefficiency of such systems in cities or highly built-up residential districts where high thermal heat retention

of buildings and streets might defeat any effort to find cool night air to draw into the house.

As a whole, however, Professor Miller showed that attic cooling is a favorably efficient system and, because of its inexpensive construction and maintenance can be aptly called "poor man's air conditioning."

That air movement as a method of cooling is as ancient as history was indicated by illustrations of Arizona's cliff dwellers, workable systems of air conditioning in their homes. Council rooms were discovered that had been dug 10 and 15 feet into the ground and had a 20-foot square roof covered with logs. A large flue in the center ran out the roof and adobe walls one foot thick and 6 feet high were all important parts of this primitive comfort cooling system. Also tombs in Egypt show burial rooms thousands of years old and

OFFICERS

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To fill the unexpired term of Harry J. Hoff—Louis Lehnen.

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Columbus—Henry Loesch
Fort Wayne—Charles Tharp

without visible dust streaks or smudge. This shows that the pyramids had somehow been ventilated . . . and by systems that were in working order centuries later. During the course of the ensuing discussion Professor Miller declared, in answer to a question, that an ordinary frame house does not need as much humidification as is often supposed and that continued exposure to ideal humidity conditions can reduce human resistance to outside weather.

Insulation

After the dinner Professor T. K. Sanders of Purdue, discussed "Insulation and Its Applications." The speaker pointed out that the first recorded use of insu-

lation was by primitive man cutting strips from the cork oak trees to use as a covering. Cork apparently was then, as now, a major form of insulation.

Professor Sanders showed that houses too tightly insulated can accumulate condensation in walls, but generally such moisture is traceable to moisture gathering on the roof and leaking down the sidewalls. A coating of aluminum paint on sheathing before roofing will alleviate, somewhat, the vapor pressure action of moisture through walls. Professor Sanders stressed the point that attics should be insulated only when well ventilated; that streaks on walls frequently can be traced to vapor seeping through the plaster between laths depositing dust.

He also advocated construction of houses as nearly vapor proof as possible and declared that insulation in walls of poorly ventilated houses can become damp and rot the walls. A suggested remedy is the drilling of holes up under the eaves and along the bottom of the wall to create a draft and thus dry out the insulation.

Action of Air in Ducts

Professor McClure, of Purdue, talked on the "Action of Air in Ducts." He gave a demonstration with a device consisting of a wooden frame with the front glassed in. Openings at the top and both sides admitted an ammonia gas mixture which plainly showed every movement of the air in the box. At the back a forced draft was created by inserting an ordinary hair dryer to blow the air in through miniature registers. The air turbulence created when air was introduced through registers at top or bottom was clearly shown. Professor McClure pointed out that the most efficient air distribution was attained by having the air enter at the center of the ceiling. Professor McClure advocated thermostats placed at the five-foot level.

Laying Out a Duct System

Saturday morning Professor Miller opened the session with a talk entitled "Laying Out an Air Duct System." He demonstrated with a miniature duct system in which provision was made for inserting slides with various types of directing vanes. Each slide had different turns, elbows, fittings and when the ammonia gas was blown through the action of the air stream was clearly visible.

Speaking on sound insulation, Professor Miller said that noises originate in many places, most of which can be taken care of by good insulation.

Noises may originate in the motor or in the duct work. Duct noises can generally be taken care of by insulating the duct but the insulation must be cemented to the duct and not just wrapped around it. Motors and fans as a source of noise must be insulated from the buildings in which they are placed. Fan blade noises are generally the result of poorly designed fan blades and cannot be insulated. Ducts which can amplify noise should be corrected during construction; for instance, the width must never be more than five times the depth. He also scored carelessness by engineers and mechanics who lay out and connect low pressure areas in the duct work to high pressure areas; in other words, large ducts to small ducts with short transitions. Rough edges left when two such pipes are joined can contribute materially to the possibility of noise in the ducts.

Professor Miller's last discussion was on "Refrigeration and Domestic Cooling," illustrated with a blackboard outline of a system using cold water.

License Fee Misuse

As for business, practically all such was done by appointed committees. One resolution of interest dealing with the diverting of building department fees into general municipal funds brought out this resolution:

Whereas:—The present Indiana law specified that all funds collected from the operation of building departments be turned into the general fund and leaving no funds available for use in such departments except by appropriation by the act of the council,

Be It Resolved:—by the Sheet Metal & Warm Air Heating Contractors' Association of Indiana, Inc., now in convention assembled on the fourth day of February, 1939, at the Fowler Hotel in Lafayette, Indiana, that the legislative committee be and are hereby instructed to at once proceed to use their influence leading to the revision of present State laws and the enactment of such laws as will permit the common councils of the cities of 1st, 2nd, and 3rd class to create building departments and provide for any funds collected thereby to be retained in such departments and used for operating expenses for such departments and used in the purchase of any and all equipment, provide for the employment of any and all required competent officials and clerks, etc., found necessary to produce the enforcement of any such law or ordinance all for the ultimate protection of the citizens of the state of Indiana against the hazardous, unhealthful elements prevailing under the present State law.

New York State Convention

The annual convention of the New York State Sheet Metal, Roofing & Air Conditioning Contractors' Association, Inc., is being held at the Ten Eyck Hotel, Albany, New York, on March 2, 3 and 4. There are attendance prizes at each meeting for those who are on time and stay for the complete meeting. The program follows:

Thursday, March 2:

Registration and Distribution of Badges.
President Burton Stevens, Address.
Appointment of Committees.
General Discussion.
Luncheon—"Terrace Garden."
Welcome Address.
"Sheet Metal Opportunities," by Paul B. Andrews of Revere Copper & Brass Co., Inc.
"Coal Tar Pitch Steep Roofs," by Elmer R. Hyde, Technical Department, Koppers Company.
"Prices-per-Opening," by J. D. Wilder, Editor, American Artisan.
"Air Conditioning Registers," by C. J. Pearson, United States Register Co.
"Stainless Steel and Extra Profits for the Sheet Metal Shop"—Sound Moving Pictures—C. C. Snyder, Alloy Steel Division, Republic Steel Corp.
Open House.

Friday, March 3, 1939:

Announcements.

"What Have You Done?" by Edwin A. Scott, Editor, Sheet Metal Worker.

"Poe's Short Method of Pattern Development"—Ralph W. Poe. Sponsored by American Rolling Mill. (Bring your pencil and paper for notes.)

Luncheon with Architects and Engineers—Terrace Garden.

"Building Contract and Sub-Contract," by J. G. Fink.

"Association Work and Its Effect on the Warm Air Furnace Business," by L. R. Taylor, President, International Heater Co.—President, National Warm Air Heating & Air Conditioning Association.

"Simplified Methods of Figuring Mechanical Warm Air Heating," by Guy A. Voorhees, Furblo Mfg. Co. (Bring your pencil and paper for notes.)

Educational Moving Pictures—"California Giants"—California Red Wood Association.

Saturday, March 4, 1939:

Unemployment Insurance (speaker to be announced)—N. Y. State Unemployment Insurance Dept.

"Group Compensation," by Thomas G. Gorman, State Insurance Fund.

Banquet with Entertainment and Dancing.
Clarence J. Meyer, Secretary,
569 Genesee St., Buffalo, N. Y.

For your convenience a number has been assigned each item. Check the items in which you are interested on the coupon on page 92 and mail to us.

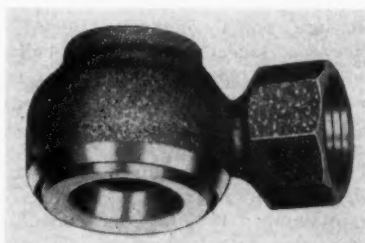
● Indicates product not listed in 1939 Directory.

△ Indicates product and manufacturer not listed in 1939 Directory.

NEW PRODUCTS

1—Wide Angle Spray

Spraying Systems Co., 4922 W. Grand Avenue, Chicago, announces a new line of spray nozzles—"Parasol" non-clogging—for air conditioning, air washers, air coolers, brine spraying,

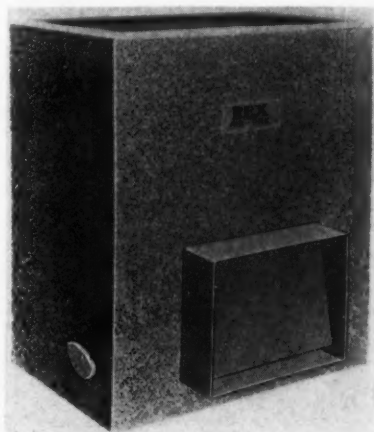


chemical processes, or wherever wide spray angle is required. Spray is of the hollow cone type with uniform distribution and wide spray angle.

Standard stock construction is brass—other metals can be specified.

●2—Patrol Modulator

Air Controls, Inc., 1933 W. 114th St., Cleveland, has recently developed a new system of blower and furnace control—the "Patrol Modulator." This new unit with a humidifier, offers home owners of limited income complete, automati-



cally controlled winter air conditioning—at a price near the conventional single speed blower.

The new "Patrol Modulator" regulates both the fire in the furnace and the volume of air from the blower automatically. This system of control replaces the room thermostat, furnace-stat and damper motor at a much lower cost. It provides a "floating"

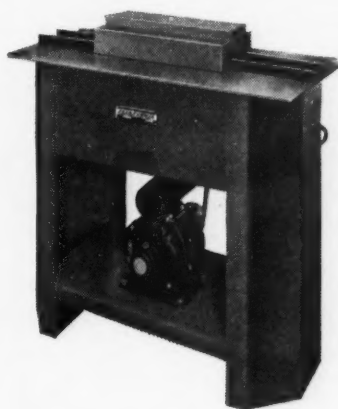
movement of the furnace draft and check doors, maintaining a smooth, even fire in the furnace at all times.

The blower operates on the modulated flow method. The volume of air is kept in correct balance with the temperature of the air rising in the bonnet of the furnace. The air that emanates from the registers in every room always feels comfortably warm and that chilly sensation is eliminated.

The motor with the "Patrol Modulator" does not use its full wattage when it is not needed. As the volume of air from the blower decreases, the power consumption of the motor decreases proportionately. This results in a definite saving to the user.

3—Lockformer 22

The Lockformer Co., 4409 W. Kinzie Street, Chicago, has just placed on the market a dual-purpose machine for making Pittsburgh locks and double seams, known as the Lockformer 22.



While designed to make both types of locks, the machine is available with one set of rolls for making only Pittsburgh locks, if desired.

The Lockformer enables one man, in one operation, to produce perfect locks at the rate of approximately 35 ft. per minute on material 22 gauge and lighter. It is power-driven and may be plugged into a light socket.

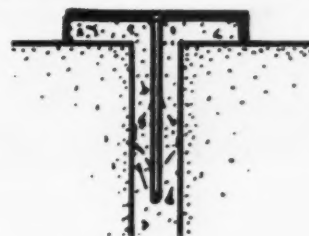
The recess for the flange on Pittsburgh locks is $\frac{1}{8}$ in. and the hammer-over edge is adjustable. For double seams there is a $\frac{3}{8}$ in. recess for the flange, and this lock may be used to form both edges of the seam or joint. In making Pittsburgh locks it is not necessary to re-square the sheet, neither on double seams is it necessary

to use a grooved rail or a grooving machine.

The Lockformer has dimensions of 36x16½ in. by 36 in. high and weighs about 300 lbs.

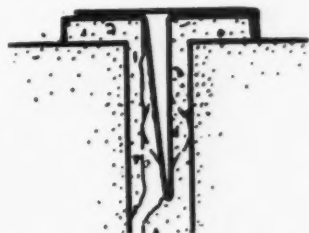
△4—Perfection Joint Covers

Dusing and Hunt, Inc., 1900 Elmwood Avenue, Buffalo, New York, has patented a device, designed by an



architect, to properly and permanently protect the joints in copings on parapet walls and in projecting courses—cornices, belt courses, and multiple sills.

This cover is constructed of twelve ounce lead coated copper and is designed and shaped from one piece of



metal so it will expand with the contraction of the stone, (natural cast or terra cotta) and therefore, maintain a positive seal at these joints preventing the leakage into the crevices.

No special mastics or compounds are needed as regular mortar is satisfactory.

Perfection Joint Covers can be applied to joints in old buildings as readily as they can be used for new.

5—Roof Fastening Clip

National Stainless Clip Corporation, 51 Chambers St., New York City, offers the stainless Vee-Clip roof fastener. When in position under the shingles, they remain firmly upright and do not have to be held in place to complete the fastening. The two bands, extending in V shape well under each shingle, give great resistance in two directions against wind pull.

Features are ease of application and labor saving. Samples are available.

New Products

For your convenience in obtaining information regarding these items, use the coupon on page 92.

6—Rubber Flex Pillow Block

S K F Industries, Inc., Front Street and Erie Avenue, Philadelphia, is introducing the new "Rubber-Flex" pillow block.

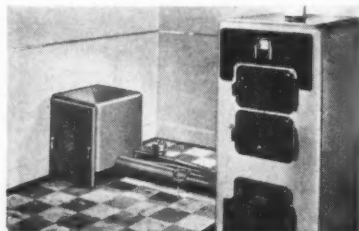


This new unit comprises a self-locking bearing of the S K F Grip-lock type. This bearing is inherently aligning, thus compensating for inaccuracies of set-up and conditions of shaft misalignment without binding or in any way impairing the load-carrying capacity of the bearing. In addition, the use of this unit brings about manufacturing economies because it requires no machining of the shaft.

The bearing is encased in a pressed steel housing equipped with felt seals to exclude dirt. The housing is provided with means for lubricating the bearing. The bearing and housing are surrounded with an elastic material having special sound-absorbing characteristics, and the material has been specially treated to make it impervious to oil and grease.

7—Coal Flow Series

The Iron Fireman Manufacturing Co., of Portland and Cleveland, has introduced an improved domestic "Coal Flow" series. The gear case and fan unit is mounted next to the



wall of the coal bin, leaving a maximum amount of clearance immediately in front of the furnace or boiler. The feed worm extends into the coal bin.

Power is transmitted to the worm by means of a sprocket and chain drive, which is completely sealed in a

grease-packed housing. Feed worm, with a metering section of smaller diameter, is made of cold rolled alloy steel, which is wrapped around and welded to a steel core.

A Volumeter of refined design constantly adjusts the rate of air feed. Two low-torque agitators are installed. Made in sizes with capacities from 30 to 150 pounds of coal per hour. Teeple controls are installed.

8—Hydraulic Action Control

Julien P. Friez & Sons, 4 N. Central Avenue, Baltimore, announces a new line of controls, of which solid liquid-filled hydraulic action thermal systems form the basis. Great advances are



claimed for this hydraulic action system which is sealed permanently both in respect to sensitive element and switch. Practically unlimited power gives a new conception of switching mechanism. These are extremely heavy, with high load carrying capacity (25 amperes at 20 V., 15 amperes at 240 V., A. C.), and designed for long and reliable service. Immune to adverse operating conditions.

The Fan or Warm Air Limit Switch, an example of which is illustrated, has fast sensitivity, adjustable differential and is available in simple or combined forms, including two speed types for either three or five lead motors. Limit controls for hot water and steam systems are shortly to be available.

△9—Electric Filter Watchman

Simplex Controls, 3129 So. Broadway, St. Louis, is manufacturing the filter Watchman, a new device to warn the owner of an air conditioning system, when filters are clogged to the extent that they should be cleaned.

The Watchman is primarily a bel-



lows operated electric switch, which is mounted on the outside of the conditioner, between the filters and blower.

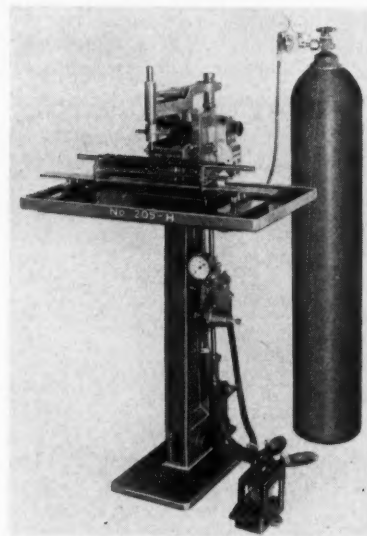
By a simple adjustment the Filter Watchman may be set for any desired pressure drop through the filters. Any excess pressure depresses the bellows of the instrument making electric contact to light a red signal. The signal continues to burn until the filters are removed.

It is claimed for this device that it will pay for its cost in 30 days by maintaining maximum conditioner performance with minimum operating cost.

Patents on the device are pending.

10—Hydrogen Gas Welding

Eisler Engineering Co., Inc., 750 S. 13th St., Newark, N. J., offers an electric spot welding machine equipped with an automatic hydrogen gas economizer, for welding molybdenum, nickel or other similar metals. To pre-



vent oxidation, hydrogen gas is introduced at the time of welding, with the flow directed directly to the spot where the welding takes place.

The automatic gas economizer and shut-off valve are so arranged that immediately after the weld is completed the gas is cut out and this gas burns at the spot only during the actual welding operation.

New Products

For your convenience in obtaining information regarding these items, use the coupon on page 92.

11—Fan Blades

Wm. J. Lohman, Inc., 62 Ninth Avenue, New York City, manufacturers of ventilators, exhaust fans, furnace boosters, etc., insure their equipment against noise and vibration by using Lohman fan blades. These blades are stamped and formed, assuring perfect balance and alignment and a large volume of air per watts consumption. They are made in sizes from 19 to 60 inches.

12—Fire-proof Filter

Air-Maze Corp., 5200 Harvard Ave., Cleveland, announces an all-metal, viscous type filter panel unit, with freedom from fire risk, and low air-resistance.

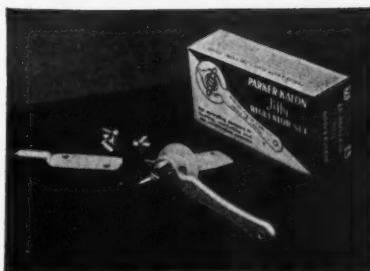
Air-Maze filters are of patented construction, consisting of a maze of alternately-placed and exactly-spaced flat and crimped wire screen baffles having meshes of successively increasing fineness; these baffles being heavily galvanized to resist corrosion. The purpose and effect of this screen graduation is to cause the larger particles of collected material to stop at the first, (large mesh,) screens, and the finer dust to be deposited on the succeeding smaller meshes; thus minimizing the tendency to clog and obstruct the free air-flow through the filter. Longer operating periods are thus obtained between cleanings; and because of the unique construction of the screens the accumulated dirt is easily and quickly rinsed out. Not only are the screens themselves naturally non-inflammable but they also tend to act as an efficient flame arrester to prevent the



transmission of flame through them to other parts of the duct system—of considerable importance where inflammable solvents or dust are handled. The oil used for "charging" the filters conforms to the regulations of the National Board of Fire Underwriters, Regulation No. 152, Pamphlet No. 90.

13—Improved Damper Sets

Parker-Kalon Corporation, 200 Varick Street, New York, announces important changes and additions to their line of damper sets.



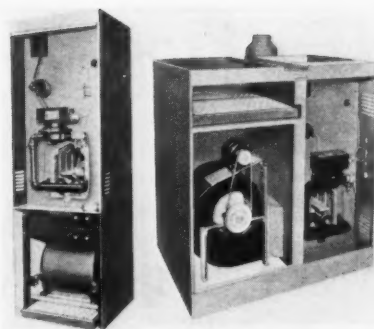
1—The Dial damper regulator has been improved by relocating the opening in the frame so that it is eccentric with the opening in the lever, the damper bearing or rod is firmly held in position, eliminating annoying damper rattles.

2—The $\frac{1}{4}$ and $\frac{3}{8}$ in. Dial regulators as well as the $\frac{3}{8}$ and $\frac{1}{2}$ in. UNXLD quadrants and bearings are now available from stock made of brass.

3—A new improved type of Spring-in round end bearing ($\frac{1}{4}$ and $\frac{3}{8}$ in. sizes) has been developed, which simplifies the installation of dampers in the small ducts common in air conditioning systems.

4—The $\frac{1}{4}$ (No. 145) and $\frac{3}{8}$ in. (No. 195) Dial regulator sets; also the $\frac{3}{8}$ in. (No. 385) UNXLD quadrant set now include the new Spring-in bearings. Two new Dial regulator sets $\frac{1}{4}$ in. (No. 145-T) and $\frac{3}{8}$ in. (No. 195-T) as well as a new $\frac{3}{8}$ in. (No. 385-T) UNXLD quadrant set have been added. In these new sets the regulator and quadrant are assembled with a special locking nut.

5—Of particular interest is the new $\frac{1}{4}$ in. (No. 7) JIFFY regulator set.



14—Gas-Fired Series

The General Electric Air Conditioning Department, Bloomfield, N. J., has just developed a new series of gas-fired warm air conditioners, available in both horizontal and vertical combinations with capacities of from 60,000 to 216,000 Btu per hour. The vertical, or highboy, type considerably increases the number of possible applications. The highboy can be used with or without a duct system.

The horizontal unit is a further development of the gas-fired warm air conditioner announced some time ago by General Electric.

Both of the new types of gas-fired conditioners automatically heat, clean, circulate, and humidify the air, in a single compact unit. For each heating capacity except the largest size there are two basic air flows available. The units are equipped with variable-pitch motor pulleys. Summer cooling may be added later.

The units are complete with General Electric controls and may also be had with throttling limit controls. Standard control includes a fan and limit switch. The fan switch starts and stops the fan at predetermined temperatures conducive to good air distribution and uniform heating. General control is by room thermostat.

The fan and motor assembly is isolated by rubber mountings and flexible canvas connectors, giving exceptional freedom from vibration. Conditioners of both types have a guaranteed efficiency rating of 80 per cent. The air flows for various models range from 675 to 2700 cfm.

Filters of viscous-coated glass wool are easy to remove, and burners, controls, fan, and fan motor can easily be reached by removing the front panel. Jackets are insulated with a corrugated asbestos air cell which reduces jacket losses. Several combinations of humidifier assemblies and controls provide a wide range of humidifying capacity.

The new vertical-type units are available with capacities of 60,000, 78,400, 96,000, and 112,800 Btu. Cast-iron heat transfer units and gas burners are mounted above the rigidly reinforced fan compartment.

The horizontal-type units, with rated outputs of 18,000 and 216,000 Btu, provide identical functions.

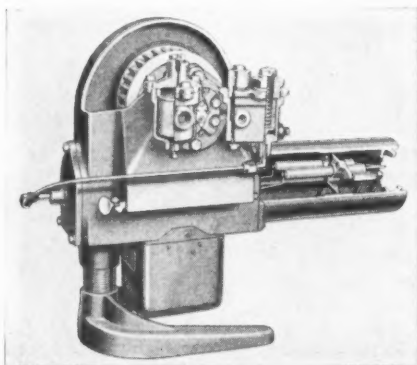
Both types are enclosed in two-tone gray steel cabinets.

New Products

For your convenience in obtaining information regarding these items, use the coupon on page 92.

15—Rudy Oil Burner

The Rudy Furnace Company, Dowagiac, Mich., announces a new forced draft oil burner as an addition to its line of heating and air conditioning equipment.



The new burner has a capacity range of from 1 to 3 gallons of oil per hour. It is to be furnished with or without controls. Designed for the Rudy winter conditioner or as a conversion burner.



• 16—Fuel-Changer

Aldrich Company, Peoria, Illinois, announces the Aldrich Sav-Haf heavy fuel oil burners with a Fuel-Changer for No. 5 oil.

The Aldrich "Sav-Haf" heavy fuel oil burners with the Fuel Changer added, will burn fire as small as 1.0 G. P. H. without trouble.



17—Dezerter Koolers

Utility Fan Corporation, 2528 Santa Fe Ave., Los Angeles, announces for 1939 a new inside room cooler and a broader line of Dezerter Koolers.

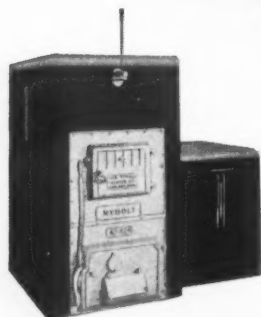
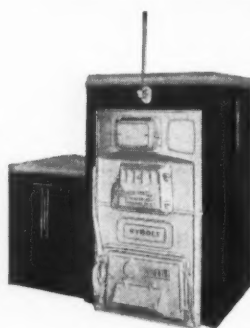
The inside cooler uses the same principles of evaporative cooling that have been successfully proven in the Utility Dezerter Kooler. It was designed to make installations possible in buildings where window or room coolers are not practical. The inside cooler is self-contained, with a 1/4 in. copper tubing connection to the water supply. The cabinet is die-formed of rust-resisting steel, baked enamel finish and bronze trim.

The 1939 line of Dezerter Koolers includes seven models, of 1,000 to 10,000 cfm capacity.

Sell Complete Modernization

WITH RYBOLT COAL-FIRED AIR CONDITIONING UNITS

At right. The Series 157 Winter Air Conditioning Unit.



At left. The Series 600A7 Winter Air Conditioning Unit.

Now there's a real selling point. COMPLETE Modernization! Home-owners cannot feel that theirs is a truly modernized home if they still have the old, inefficient, unsightly furnace in the basement. It's your job to call on these people, show them where an ultra modern, Rybolt Coal-fired Air Conditioning Unit of type shown here, will not only save them many dollars in operation during the heating season, but will also greatly enhance the appearance of their newly decorated basements. Sell COMPLETE Modernization and you'll enjoy your own private business boom.

The Series 600A7 with a steel heating element, and the Series 157 with cast iron heating element will fill the bill on any installation. Write TODAY for further literature on these and other RYBOLT money-makers.

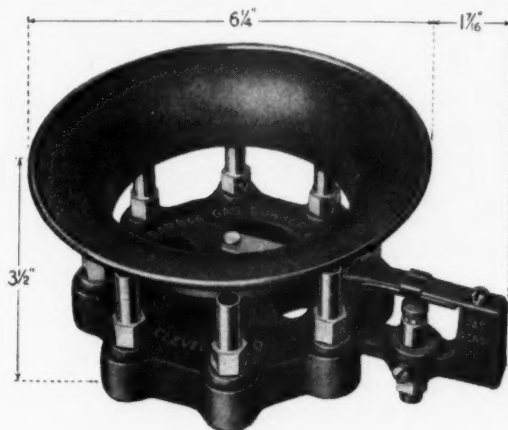
THE RYBOLT HEATER COMPANY
ASHLAND, OHIO

BARBER BURNERS



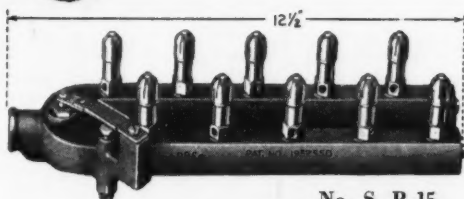
for All Gas-Burning Appliances

Barber is rated as the most dependable source of supply for gas burner units, because Barber has had over 20 years' experience with *other people's* burner problems. That makes dead certain that a Barber equipped appliance has the *proper* burner for its specific requirements. Barber units attain a flame temperature of 2000° F. on atmospheric pressure, with complete combustion on every type of gas, including Butane. Follow the advice of experts—if it's a gas burner job, let Barber do it!



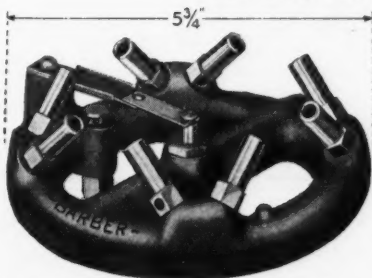
No. BP-81
Barber
Burner
with Safety
Pilot

No. C. U.-90
Barber Burner
with Safety
Pilot



No. S. P.-15
Barber Burner
with Safety Pilot

We are Gas Burner Specialists and offer you the facilities of our Engineering Department and Laboratory on your Gas Burner Problems.



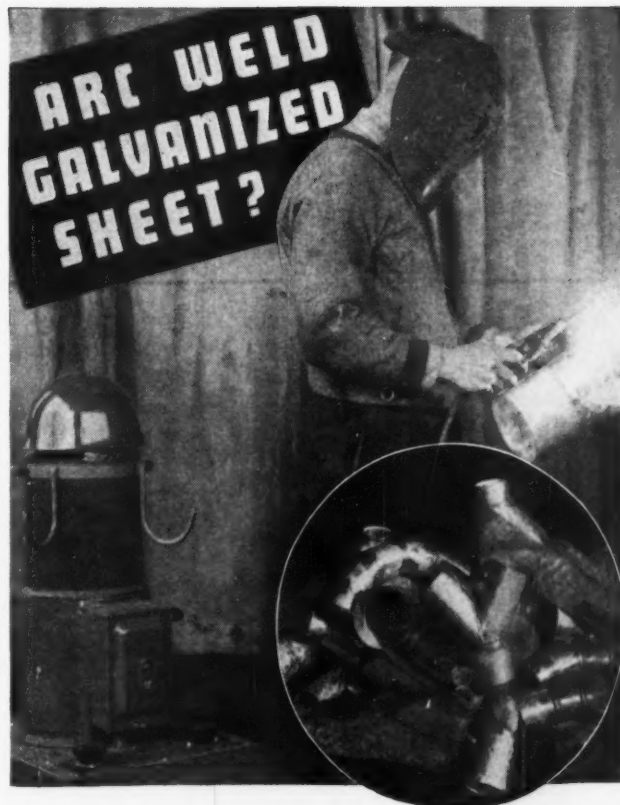
Avail yourself of the complete and improved line of Barber Burner units, gas pressure regulators, and controls. Write for latest catalog and price list.

THE BARBER GAS BURNER CO.
3704 Superior Ave., Cleveland, Ohio

Address Michigan inquiries to
The Barber Gas Burner Company of Michigan
4475 Cass Ave., Detroit, Michigan

BARBER *Automatic* JET GAS BURNERS

● **for Warm Air Furnaces**
Steam and Hot Water Boilers ●
and Numerous Other Heating Appliances



Group of arc welded galvanized turns and fittings for dust-collecting system.

"ABSOLUTELY!" says this Lincoln user

● "We arc weld everything that must be rigid and tight and galvanized sheet is no exception. Our arc welded galvanized products include fittings, turns and long runs for dust-collecting systems; canopies; sky-lights; ventilators; hoppers and hundreds of special items. We have found that costs are about the same and the product is more rigid, has tighter joints and is better looking than the former riveted-and-soldered construction. Users report that our welds, made by the carbon arc process with a Lincoln Welder and bronze welding rod, are practically as corrosion-resisting as the sheet itself."

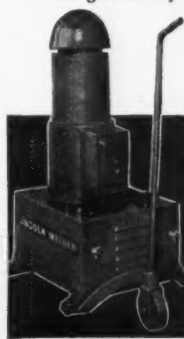
This report is from a sheet metal contractor in Rochester, N. Y., who keeps four Lincoln Welders busy.

Investigate the possibilities for increased business and lower costs through the use of Lincoln arc welding for all kinds of metals and alloys. See how *your* company can profit. The nearest Lincoln office is at your service. Mail the coupon today.

THE LINCOLN ELECTRIC CO.

Largest Manufacturers of Arc Welding Equipment in the World

MAIL THIS COUPON TODAY



THE LINCOLN ELECTRIC CO.
Dept. EE-573, Cleveland, Ohio

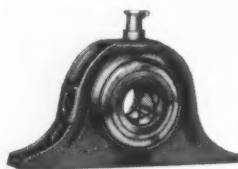
Send free copy of Bul. 314 and payment details on the Lincoln Sheet Metal Shop Welder.

Name _____ Position _____
Company _____
Address _____
City _____ State _____

Use these new RANDALLS for PILLOW BLOCK SATISFACTION

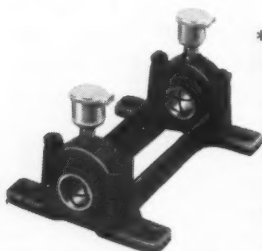
They have all these features—

- Unusually large oil capacity
- Universal self-aligning at all times
- Self-lubricating
- Extremely quiet
- Heat responsive
- Compact housing
- Minimum running torque
- Long-lived and sturdy



ONE-PIECE STEEL HOUSING PILLOW BLOCK

A low priced bearing as efficient in operation as other Randall Pillow Blocks. Simple in construction, light in weight, yet sturdy enough for any application. Mounting can be made in any of four positions. Consisting of only three parts, it is easy to assemble and is interchangeable with all other Randall Pillow Blocks of like size. The oil capacity of the cast iron reservoir in the ball of this pillow block is as large or larger than that of any other sleeve type pillow block on the market today.



*DUPLEX STANDARD PILLOW BLOCK

An outstanding Randall contribution for attic fan use. Two Standard Pillow Block bases cast integrally, provide a strong, rigid one-piece base that eliminates vibration and will not distort yet permits full alignment of the shaft at all times. It can be mounted vertically if elbow oilers are specified.

**Large oiler shown at slight extra cost.*

Write for new 1939 catalog describing in detail our complete line and listing new low prices.

EASTERN STOCKS

Tek Bearing Co.
177 Lafayette
New York City

American Stock Gear Co.
100 St. Clair Ave., N. W.
Cleveland, Ohio

PACIFIC COAST STOCKS

Utility Fan Corp.
Los Angeles, Cal.

C. W. Marwedel
San Francisco, Cal.

Randall GRAPHITE PRODUCTS CORP.
Dept. 211 609 W. Lake St., Chicago, Ill.

Association Activities

St. Louis

The Sheet Metal Heating and Air Conditioning Contractors Association of St. Louis will hold a dinner dance Friday, February 17, at the Edgewater Club, 5500 South Broadway.

Speaker of the evening will be Raymond Tucker, Smoke Commissioner of St. Louis. Guests of the evening will be the National Secretary's Council, which is meeting in St. Louis at the Statler Hotel, the 17th and 18th.

Air Conditioning Contractors' Alliance

The Air Conditioning Contractors' Alliance held its annual meeting at the offices of the Alliance, 7 South Dearborn St., Chicago, on January 16, 1939. The following officers and Board of Directors were elected:

President—Philip E. De Berard, of Conditioned Air Systems, Inc.,
Vice-President—William L. Wente, of W. L. Wente Co.
Secretary-Treasurer—R. Hamlin Petty, Sr.
Directors—Fred L. Lensing, of A. W. Lensing Sons, Inc.; W. D. Dresen, of Dresen Engineering Co.; E. Valkenaar; John H. Knol, of Midwest Ventilating Co.; W. B. Borgraeve, of Alladen Engineering Co.

Fred L. Lensing, retiring president, was paid special tribute for his industry and energy in conducting the business of the Alliance through its first year of activity.

The Alliance has a well rounded out program of activity and through the association of the Forced Air and Air Conditioning Contractors expects to maintain its program for quality installations of equipment.

Milwaukee

At the December meeting of the Milwaukee Master Sheet Metal, Heating, Ventilating and Air Conditioning Contractors' Association, Inc., the following members were elected to serve on the Board of Directors for one year:

Edward Arndt	R. H. Fetting
Angelo Hoffmann	Frank Kramer
Art Mantei	Walter Marth
Herman Reinke	Martin Schaar
Robert Schomann	

The newly elected Board of Directors then met and elected the following new officers for the ensuing year:

President—Frank Kramer.
Vice President—Robert T. Schomann.
Secretary—Angelo Hoffmann.
Treasurer—Walter Marth.

Executive Secretary and Sergeant-at-Arms—Paul L. Biersach.

Paul L. Biersach, Secy.

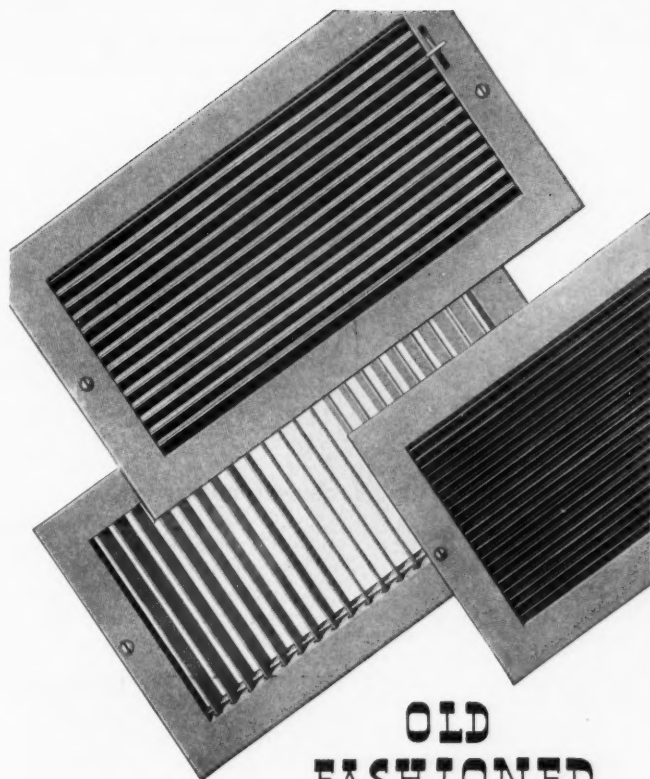
With the Manufacturers . .

Des Moines Stove Repair Dealers

Over one hundred men from Iowa and southern Minnesota attended the annual dealer school held by the Des Moines Stove Repair Company, January 30-31. The program was planned and directed by F. R. Green who had as the instructors such leaders in the heating industry as Marion Levy of Viking Air Conditioning Corp.; R. W. Blanchard of Hart & Cooley; Grant Wilson of Grant Wilson, Inc.; Harry Ebbert of The Armstrong Company (Furnace Cement); O. A. Olson of Cities Service; Nelson Delevan of Delevan Engineering; Folkerts of Autocrat; Milt Wagner of Lochinvar, and others. Claude Spring gave a talk on the ModernAire heat rule.

The two day school was divided into two general sections: oil fired units and oil burners, coal fired equipment and stokers. The evening meeting was a general round table discussion at which was presented the new service ModernAire.

Mr. Green presented the new models and explained the additions to their line.



OLD
FASHIONED
QUALITY
Plus

Smart, Modern Styling!

Go into any building equipped with AUER Registers and Grilles. Notice how well these smooth, modern faces fit into the general picture. Beneath that surface beauty, all AUER products have everything a good register must have. Auer offers an appropriate, dependable model for every heating and air conditioning purpose.

Write for complete Auer Register Book No. 39

THE AUER REGISTER COMPANY
3608 Payne Avenue Cleveland, O.

AUER REGISTERS & GRILLES

For Air Conditioning *and* Gravity

"It's Good Judgment to Offer
a Complete Heating Service
with 'AFCO'
Units for
All Fuels"



Get Your Quota of Sales

You can't afford to pass up sales merely because your present line is limited. Keen competition between the three basic fuels has made it necessary for Heating Equipment Merchandisers to offer a complete heating service. Concentrate on Sales in 1939, and meet competition—standardize on "AFCO" Equipment.

"AFCO" Sets the Pace!

Everything you need for both the new home and replacement markets. Check the perfectly balanced line of 1939 "AFCO" Models—for all fuels—for all price brackets, including furnaces and complete units, each in a wide range of sizes.

Chart Your Profits for 1939 with "AFCO"

Send for a copy of this 25 in. x 38 in. wall chart attractively illustrating, in color, the complete line of "AFCO" Equipment. For complete information ask for Bulletins giving specifications and performance data.

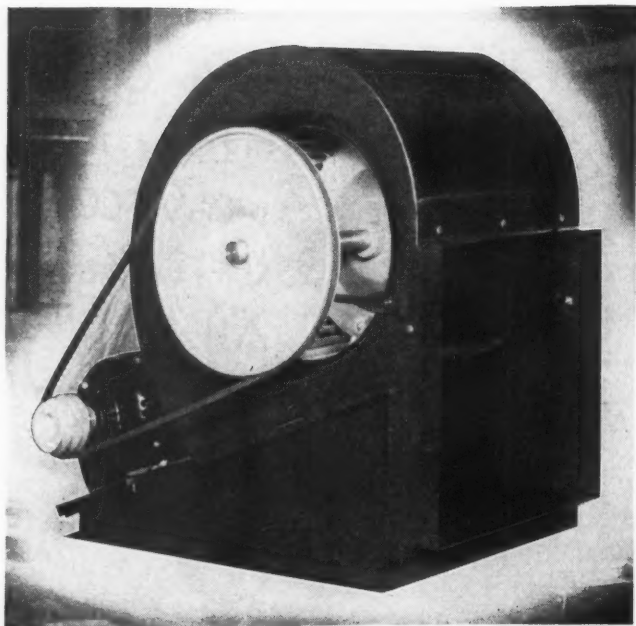
There are still many territories available for Wholesale Distributors and Installers. Don't make any decision for 1939 until you have fully investigated the exclusive advantages of the "AFCO" Franchise. Use the handy coupon.



AMERICAN FURNACE CO.
2719-31 Delmar Blvd. St. Louis, Mo.

Fill Out—Clip and Mail To-day.

American Furnace Co. 2719-31 Delmar Blvd., St. Louis, Mo. Air Cond. Div. A.A.F.
☐ Send Wall Chart
☐ Send Bulletins and complete price information, without obligation.
 Name
 Address
 City..... State.....
 Signed



To meet the new demand—
VIKING BLOWERS
are now available with
HIGH-LOW AUTO-MATIC SPEED CONTROL

• Now you can get the increased efficiency and improved performance of VIKING blowers—plus the benefits of automatic speed control. A two-speed motor, thermostatically controlled is offered, at slight extra cost, on all VIKING blower units. This combination puts new life in your winter air conditioning sales, and gives you that extra "plus-value" that helps you to dominate competition.

HIGH-LOW Control does this:

- Starts heat circulation sooner, and nearly doubles air-circulating period.
- Makes available (with 3-speed drive) 6 blower speeds, two of them controlled automatically.
- Prevents "cycling", and increases furnace efficiency.
- Increases economy of blower operation and reduces fuel cost.
- Banishes "Cold 70", and eliminates air-stagnation.
- Gives quicker, more even heat and eliminates "over-run".
- Adapts blower for summer air-circulation and cooling.



In addition to blowers, VIKING makes standard package units, humidifiers and attic fans—all VIKING engineered for greatest efficiency—send for Bulletin No. 106.

With the Manufacturers . . .

August J. Hartfield

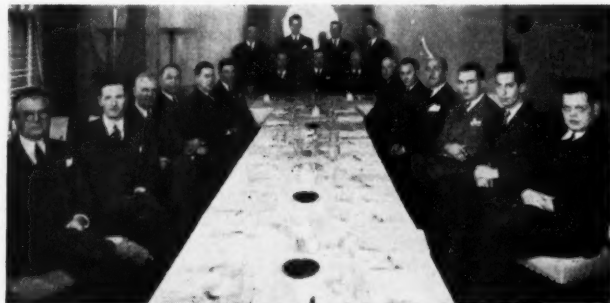
The Pacific Gas Radiator Company, Los Angeles, announces the death of its president and founder, August J. Hartfield, on January 1, 1939.

Bow With Reeves Steel

Harry G. Bow has become manager of sheet sales, Reeves Steel and Manufacturing Co., Dover, Ohio. Widely known as a sheet steel salesman, Mr. Bow formerly was associated with The Berger Mfg. Co., Canton, Ohio, as general manager of sales, and later held a similar position with the Milwaukee Rolling Mill Co. He also was manager of sales The Superior Sheet Steel Co., Canton, Ohio, for a number of years.

Anchor Annual Sales Conference

Anchor Stove & Range Company, New Albany, Indiana, announced aggressive new sales and advertising plans for 1939 on Anchor Kolstokers at the annual sales conference on December 1, 2 and 3. The three-day session was attended by regional sales representatives and branch managers.



Samuel F. Baker, general manager, stated that Anchor's manufacturing facilities are being expanded and the engineering and production staffs strengthened through the addition of several experienced stoker men.

Several private meetings were conducted by C. M. Lewis, director of sales, in discussing the new sales plans and new cooperative policies with dealers and distributors. Heads of the Anchor engineering and production departments demonstrated many new mechanical advancements that were being incorporated for 1939.

Independent Air Filter Company

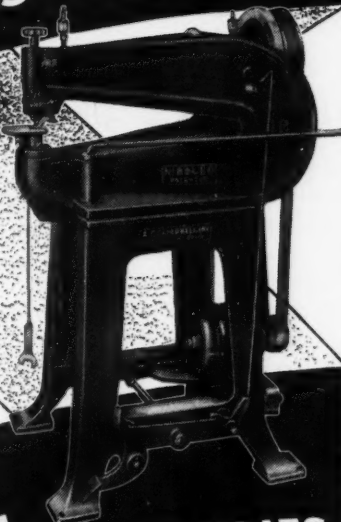
Announcement is made that the Independent Air Filter Company, of Chicago, has decided to discontinue its business. The affairs of the company are now in liquidation and the process will be completed as rapidly as possible. Adequate arrangements have been made to complete all outstanding orders and continue indefinitely all required service to customers having Independent equipment.

Subsidiaries Unify

American Radiator & Standard Sanitary Corporation announces to the heating and plumbing contractors that the manufacture and sale of the products of their subsidiaries—American Radiator Company, Standard Sanitary Mfg. Co., American Gas Products Corporation, Ensign-Reynolds, Inc., Excelso Products Corporation and The Fox Furnace Company—have been unified and from February 1, 1939, all products will be manufactured and sold under the same trade names and trade marks directly by American Radiator & Standard Sanitary Corporation.

This centralization means that the heating and plumbing trade will have the advantages of (1) uniformity of sales policy, (2) co-ordinated manufacturing, providing undivided responsibility for the quality and dependability of products, and (3) nation-wide display, distribution facilities and national advertising.

IRREGULAR SHAPES
cut for 20% to 80%
LESS COST



-with CAMPBELL NIBBLING MACHINES

-and cut better!

● Campbell Nibbling Machines cut irregular shapes in steel or other commercial materials up to one-half inch thick with greater economy than is possible by any other method. Savings often run as high as 80%. The machines frequently eliminate the cost of dies for short runs.

Campbell Nibbling Machines cut better—because they do not distort materials, set up internal strains or cause invisible fractures. Edges are left with no burrs—and require little or no finishing.

BUY ACCO QUALITY in Campbell Cutting Machines, Wright Hoists, Page Welding Electrodes, American Chains, Tru-Lay Preformed Wire Rope and Reading-Pratt & Cady Valves.




ANDREW C. CAMPBELL DIVISION
DESIGNERS AND BUILDERS OF SPECIAL MACHINERY
BRIDGEPORT, CONNECTICUT

AMERICAN CHAIN & CABLE COMPANY, Inc.

In Business for Your Safety

THE *Symbol* OF THE NEW
AUTOMATIC HEATING



METAPHRAM REGULATORS

for **DURABLE FURNACE CONTROL AT LOW COST**

METAPHRAM combustion Regulators are self contained and the diaphragm units are the most powerful and durable of any metal diaphragms. Extremely accurate and sensitive. Metaphram Regulators represent the highest development in the regulation of fuel combustion to maintain steam pressures and water or air temperatures within close limits.

SECTIONAL DIAPHRAGM - - EXCLUSIVE FEATURE

The unusual and exclusive design of the individual diaphragm, or Metaphram, which is made of the highest quality admiralty brass and which gives it its great power and resiliency is responsible for the power and durability of Metaphram Regulators. Sensitive elements in all Metaphram Regulators may be easily replaced in case of damage, eliminating the necessity of replacing entire regulators.



METAPHRAM WARM AIR FURNACE REGULATOR

OPERATES draft and check dampers so as to maintain balance between casing and return air temperatures. Provides safety by preventing excessive furnace temperatures, economy and comfort through elimination of overheating and underheating and labor saving by reducing number of firing periods.

METAPHRAM TANK HEATER REGULATOR

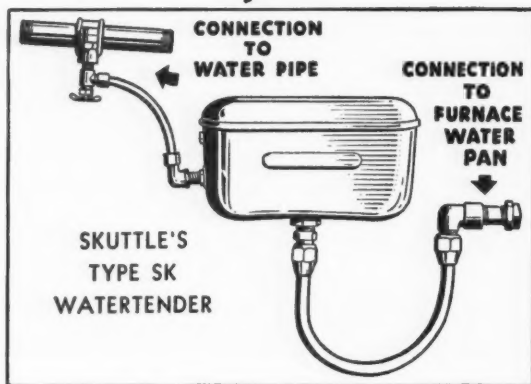
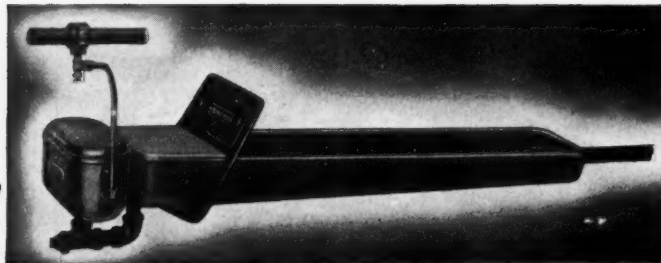


PROVIDES continuous, abundant supply of domestic hot water from coal fired tank heaters. Available in two types, immersion and surface. Mounted on vertical or horizontal pipe line, or on storage tank. Easily installed without draining water system. The lever arm of the surface type regulator is marked so that it may be adjusted for any desired water temperature.

Minneapolis-Honeywell Regulator Co., 2726 4th Ave. S., Minneapolis

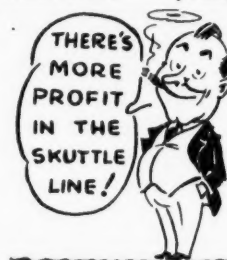
MINNEAPOLIS HONEYWELL
Metaphram Regulators

2 Ways to Make Money..



... with **LESS SERVICE CALLS!**

● It is easier to make money when you spend less on service calls, for every call you make cuts down on the profit you should realize on anything you sell. It is obvious, then, that you will make a greater profit on each Skuttle humidifier, or Type SK Watertender you sell because these units are made to work right and give a life-time of service. The D.S. Humidifier above and the SK Watertender at left have proven to dealers everywhere that the Skuttle Company does make trouble-free units, on which dealers can realize a definite profit every time they make a sale.



WRITE TODAY FOR

Skuttle

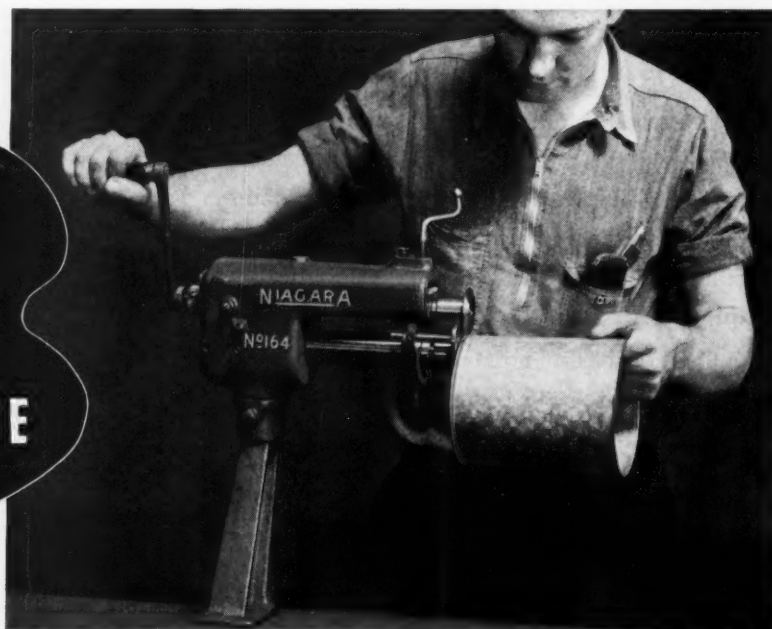
INFORMATION

J. L. SKUTTLE COMPANY

AUTOMATIC HUMIDIFIERS

999 FRANKLIN ST., DETROIT, MICH.

How to do 5 JOBS WITH ONE MACHINE



Why buy 5 machines when this one No. 164 Niagara Universal Machine does 5 jobs! Burring, Turning, Wiring, Crimping and Beading is made easy by quickly interchangeable rolls.

Clamps to bench, takes little space, gears completely enclosed, rigid cast housing maintains alignment and easy operation.

Remember,—your profits are made IN YOUR SHOP . . . good up-to-date machines and tools are a good, worthwhile investment.

This No. 164 Universal Machine is just one of the Niagara complete line of money making machines for Sheet Metal Shops,—write for Catalog No. 94.

NIAGARA MACHINE & TOOL WORKS

637-97 Northland Ave.

Buffalo, N. Y.

Branches:

Cleveland

Detroit

New York

NIAGARA

With the Manufacturers . .

Utility Fan Representatives

Utility Fan Company, Los Angeles, announces the appointment of Lou Merriam as Midwest representative, with headquarters at 36 Sanderson St., Battle Creek, Mich.

J. E. Oliphant is Eastern representative, located at 505 Huber Building, Marion, Ohio.

Air Control Products, Inc.



Robert L. Leigh

Air Control Products, Inc., Muskegon, Michigan, has been organized to manufacture registers, grilles, damper regulator sets and other accessories for the heating and air conditioning industry. This new company has an authorized capitalization of \$150,000.

Robert L. Leigh has been elected president and general manager of Air Control Products, Inc. Mr. Leigh has been associated with the Hart and Cooley Manufacturing Company for the past four years and was associated with the Uni-Flo Grille Corporation prior to that time.

Willard E. Dee

Willard E. "Doc" Dee has been appointed manager of specialty sales of Superior Sheet Steel Div. of Continental Steel Corporation, Canton, Ohio. Mr. Dee has been more than eleven years in Superior's specialty division, travelling most of the states in promotional work. For the past three years he has been identified with the sales department at the Canton office.

Henry Furnace Entertains Representatives

The Henry Furnace & Foundry Company, Cleveland, entertained representatives at a two-day convention recently. Meetings were conducted by H. S. Sharp, vice president in charge of sales.

The program included a trip to the plant at Medina, Ohio, where operations were in full swing, enabling the representatives to study the making of a furnace from pouring to finishing, including the manufacture of casings and



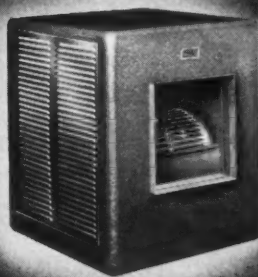
fittings. The company operates a large modern sheet metal plant. A display was arranged of twenty-two distinct types of furnaces and air conditioners. A buffet lunch was served.

There was a banquet in the evening at the Hotel Carter in Cleveland. Speakers included T. E. Henry, Chairman of the Board, who told interestingly of the founding of the company in 1893. Brief talks were made by E. S. Moncrief, president, D. H. Rickard, treasurer, and R. R. Wilson, secretary.

A discussion of engineering problems was directed by Herbert F. Curtis, in charge of engineering and Eddie Steffner, head of the drafting department. The Manual, based on the ASH&VE, was reviewed by Mr. Curtis, and a typical installation discussed by Mr. Steffner.

H. S. Sharp gave an exposition of the sales points presented by the various numbers composing the line, together with the company's policies and prospects for business the coming year. There were also guest speakers.

Investigate the **UTILITY** Line

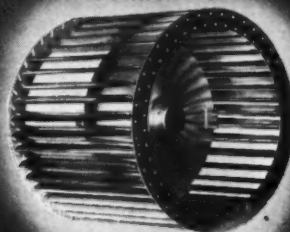
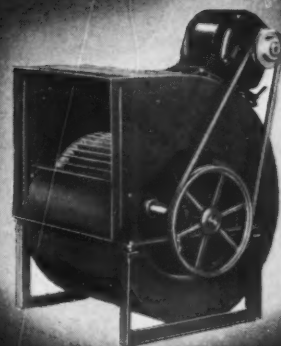


UTILITY DEZERter KOOLERS

- Complete evaporative coolers for homes, stores, shops, cafes, theaters, etc. Dynamically balanced centrifugal blower...self-contained water re-circulating system...variable speed pulleys... "No-Sag" pads. 9 models--1000 to 10,000 CFM.

UTILITY BLOWERS

- Statically and dynamically balanced...self-aligning bearings...rubber cushion mountings...completely die formed...baked enamel finish...Complete line--3" to 21" wheels--single or double inlet.

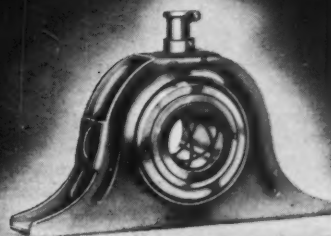


UTILITY BLOWER WHEELS

- Scientifically designed forward curve multiple vane...accurately spaced on streamlined dual hubs and heavy steel shrouds which permits greater output capacity at slower rotative speeds. Widths--3" to 24"; Diameters--6" to 24".

RANDALL PILLOW BLOCKS

- Standard on all Utility air moving equipment, to assure long, trouble-free service. Proven by years of operation on Utility Blowers, Utility Dezerter Coolers and furnace blower units.



ALL YEAR CONDITIONER

- Converts gravity furnaces into forced draft heating plants. "Dust-Stop" filters...dynamically balanced...variable speed pulley...solid top--installed by cutting top panel--no special duct fittings. Full range of sizes.

Write Today
for
COMPLETE CATALOGS
on **UTILITY**
Equipment

UTILITY FAN CORPORATION
2528 SANTA FE AVE., LOS ANGELES, CALIFORNIA

Please send me complete information on your

- ☐ Dezerter Coolers ☐ Blowers
☐ Blower Wheels ☐ Pillow Blocks
☐ All Year Conditioner

Name

Street

City State



THAT'S WHY THE *Pacific* LINE LEADS THE PROFIT PARADE IN '39'!

Pacific Gas Heating Appliances are tailored to fit your buyer's most exacting demands in price as well as quality. Pacific has the answer to every heating problem. The most complete line of gas heating appliances manufactured in the West, by a firm established since 1913.

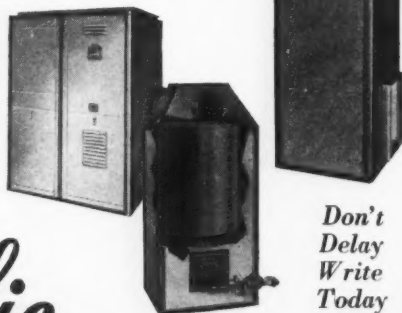
Tie up to the "Profit Line in '39."

★ ★ ★ IT WILL PAY YOU TO KNOW ALL ABOUT PACIFIC APPLIANCES...

★ Including... Gas Circulating Heaters, Radiant Circulators, Gas Steam Radiators, Wall Heaters, Floor, Dual and Single Wall Register Furnaces, Gravity and Blower Furnaces, Forced-Air Units, Duct Furnaces, Overhead Units, Blowers, Water Heaters.

★ Twenty-six years of continuous manufacturing experience building fine quality gas heating appliances.

Pacific equipment carries the A.G.A. Blue Star of Approval and meets all National Safety Requirements.



Don't Delay Write Today

Pacific
GAS RADIATOR CO.
1740 W. Washington Blvd. ★ Los Angeles, Calif.

News Items

Bryant Air Conditioning Moves

Bryant Air Conditioning Corp., of Philadelphia, moved their offices to their warehouse at 915 N. Front Street on February 1st. This move, in the interest of efficiency, will consolidate sales, warehousing and contract execution under one roof. This company distributes and installs gas heating and air conditioning equipment and rock wool insulating products.

Dealer Helps Trade School

John Maier of John Maier & Company, 1640 Chicago Road, Chicago Heights, Illinois, has received a letter from the Superintendent of the Bloom Township High School, as follows:

"In behalf of our Board of Education and especially the boys in our shop classes, I wish to thank you for your keen interest and help in connection with their work. It has been very kind of you to furnish the materials for the building trades classes at cost and especially to give so much of your time and the services of your shop in helping the boys in this work.

"We very much appreciate your interest in our school and hope we may continue to merit your loyal support."

Mr. Maier believes that every successful sheet metal contractor should give some time, thought and support to the many ambitious and energetic boys of high-school age in their community to help them along in their endeavors to branch out in the construction field.

Obituary

Phillip Hayes

The death is reported of Phillip Hayes, who was engaged in the sheet metal business at Spokane, Wash.

Adolph G. Droegkamp

Adolph G. Droegkamp, secretary and treasurer of the Droegkamp Furnace Co., Milwaukee, Wis., died Nov. 9 at the age of 63. He is survived by his widow, one sister and four brothers.

J. N. Gray

J. N. Gray, one of the veterans in the sheet metal trade of Memphis, Tenn., died December 15. His shop for some time past had been located at 836 Jefferson Avenue. He was widely known and esteemed in the craft.

J. H. Chappell

J. H. Chappell, who owned and operated a plumbing, heating and sheet metal business for 56 years, died in his 81st year on December 29, 1938. The business, located at 309 E. Main St., Richmond, Va., will be carried on by the estate. Mr. Chappell was a Lennox dealer.

Jacob Groeschel

Jacob Groeschel, a prominent sheet metal contractor of Milwaukee, Wis., died Oct. 22, after an illness of nine months. He was 67 years of age and was born in West Bend, Wis., moving to Milwaukee at the age of 14 to learn his trade. He is survived by his widow, five daughters and two sons, one of whom, George, has succeeded to the management of the sheet metal business.

William H. Otten

William H. Otten, Sr., president of the Baumgartner & Otten, Inc., a well-known and reliable sheet metal shop in St. Louis, died on December 23. Mr. Otten had been ailing for some time of heart trouble and spent about three weeks in Texas trying to regain his health. He was on his way home from Texas to enjoy the Christmas holidays with his family when he was stricken and died on the train about ten minutes before it arrived at St. Louis.

The "400 Series"

BLO-ETTE Furnace Blower



Now Available in 3 sizes!

A popularly priced package unit furnace blower that will remedy the many thousands of existing unsatisfactory gravity jobs at a price so low that it is well within the reach of everyone. Available in three sizes . . . models—401, 403 and 405 . . . 1,000 to 2,150 C.F.M. Blo-ette opens a new field in blower sales . . . every home owner a prospect!

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- No metal-to-metal contact
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- Self-lubricating bearings
- Three Sizes

*Model 405 shipped assembled but may be knocked-down.

Write now for new catalog including complete performance data, dimensions and prices.

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DAYTON • OHIO

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Machine - Made Locks Save Time and Money!

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A Good Production Forming Machine at a Reasonable Price

PITTSBURGH LOCK MACHINE with 1/2 H.P. A.C. 110-220 volt, single-phase motor, complete, ready for immediate operation—

\$270

(Add \$25 for machine equipped with Pittsburgh, and Double-Seam Rolls.)

F.O.B. Factory, Chicago, Ill.

For complete information, see your jobber, or write

The LOCKFORMER CO.
4409 Kinzie St. Chicago, Ill.



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A LARGE STOCK FOR QUICK DELIVERY

★ GALVANIZED LOCK-SEAM PIPE



THE PIPE WITH THE BIG STRONG SEAM

Widely used for Air Conveying, Dust Collecting Systems, Smoke Stacks, Exhaust Systems, etc. 10 ft. lengths furnished in sizes from 3" in diameter and larger—14 gauge and lighter.

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ROLLED STEEL ANGLE

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IN STANDARD SIZES FROM 6" TO 36"

Larger sizes rolled when desired. Also special angles, tees, channels, bars and rods rolled in any direction, to any radius or part of a circle. On the first job you'll see the difference. These flanges are accurate in every dimension, uniform in curvature, free from distortion, and have a perfectly smooth surface that insures a tight joint. Write TODAY for list of stock sizes and discount sheet.

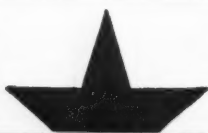


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STAR BRAND



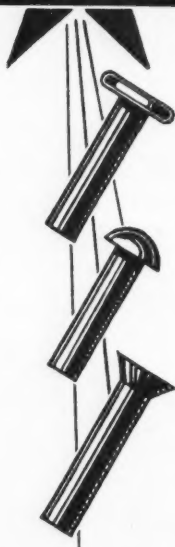
FOR EASIER, BETTER RIVETING

Star Brand Rivets mean faster, smoother going on any riveting job—and assure best results.

Precision manufacture and rigid inspection insure accurate sizes and uniform quality.

Rivets are an important trifle. Use the best—Star Brand—the standard of quality for 76 years.

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ROUND, FLAT AND COUNTERSUNK HEADS

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Special headed & threaded parts
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New Literature

For your convenience in obtaining copies of new Literature, use the coupon on page 92.

101—Oil Burner, Stoker and Heating Accessories

Robert Barclay, Inc., 122 No. Peoria St., Chicago, wholesale distributors of automatic heating accessories, is distributing Catalog No. 107 for the winter 1938-1939, listing all accessories for oil burners, stokers and forced air heating.

102—Radiant Combustion Chamber

Harry E. Gilbert & Son, 11 Brooklawn Terrace, Bridgeport, Conn., is distributing a new folder covering their radiant perforated combustion chamber or covered fire for warm air furnaces, said to save 20 to 30 percent.

103—Insulating and Cushioning Materials

American Hair & Felt Company, 222 North Bank Drive, Chicago, is distributing a new catalog showing the entire Ozite line of hair-felt products for thermal insulation, sound absorption and general cushioning. There are 28 pages, with color illustrations, descriptions and use of each of the products, and the book is completely indexed.

104—Consolidated General Catalog

A. M. Byers Company, Pittsburgh, has just published a consolidated general catalog, complete as to standard specifications, dimensions, and other information essential to the specifier and the purchaser of wrought iron, tubular and flat rolled products and steel tubular products. The book contains 56 pages and covers, is spirally bound and completely indexed.

105—DeLuxe Blower-Filter Unit

The Brundage Company, Kalamazoo, Michigan, is distributing literature covering their DeLuxe blower-filter unit, series RKF 220—a winter air conditioning unit in a novel Krinkle finish to blend with recreation-room surroundings—and the Brundage Twin blower-filter unit, series TSKF 330, designed for larger air-conditioning installations such as schools and apartment buildings. Price sheets are included.

106—Utility Fans and Blowers

Utility Fan & Manufacturing Co., 2528 Santa Fe Avenue, Los Angeles, is distributing Catalog No. B-1, entitled "Utility Fans and Blowers" for heating, ventilating, air conditioning, air washing, air drying, conveying and other domestic and commercial and industrial forced draft installations. Engineering data, performance rating and dimensions are included.

Folders describing their Desert Cooler, Utility pumps, blowers, fans and all-year conditioners are also available.

107—Pipe Crimper

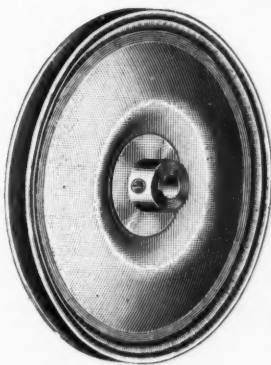
Champion Tool Company, 376 West 41st Place, Los Angeles, is distributing a folder describing their Champion pipe crimper for square and rectangular pipe for the use of those who install warm air furnace pipe, wall stacks, air ducts, and water heater vent pipe.

Eight crimps, distributed around the circumference of any size round pipe made of 26-gauge or lighter stock is all that is required to make a lap joint in two pieces of pipe of equal diameter or girth. A heavy-duty size is available for heavier gauge stock.

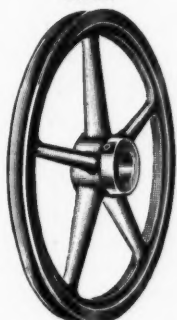
108—Drum Making Machines

Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, is distributing Bulletin No. 82 covering the methods and machines used in making steel drums, pails and containers. Production flow charts, showing typical setups of machines and general outlines of methods, as well as illustrations and brief descriptions of machines, visualize the methods. Three separate, conveniently indexed sections treat with heavy and light gauge drums and pails.

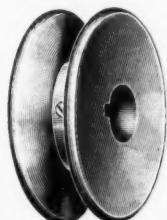
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Cast Iron



Solid Steel



Quiet Fan

**For Trouble-Free
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Motors Installations
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MAUREY Pulleys and Fans are designed and built to perform quietly and efficiently in units where dependable, continuous operation **MUST** be maintained day after day without let-up.

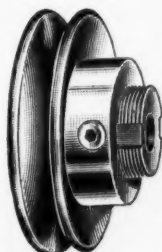
MAUREY Pulleys and Fans are accurately made, balanced and true-running; attractively finished in aluminum lacquer.

Large stocks, in a wide variety of sizes assure manufacturers and distributors adequate continuous supplies of single and double groove pulleys for both "A" and "B" Belts.

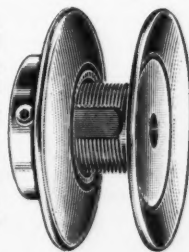
Fans are available in sizes from 6 1/2" to 16" in diameter.

WRITE FOR CIRCULARS GIVING PRICES AND DESCRIPTIONS.

MAUREY Variable Pitch Diameter Pulleys



Solid steel construction. Adjustment permits speed variation of as much as 30%. Fine, accurate, milled threads, 20 to the inch, assure close adjustment. Designed for Air Conditioning Units. Solid steel—not die cast. Made in 4 sizes, 3 1/4" to 4 1/2 inches in diameter.



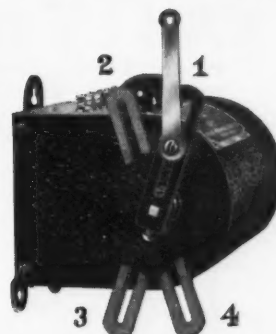
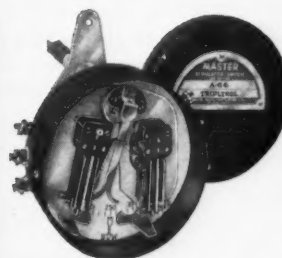
MAUREY MANUFACTURING CORP.
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PERFECT COORDINATION

The Tripltrol System built especially for hand-fired furnaces with blowers recognizes the need of functioning from three definite temperatures encountered in the bonnet of a furnace. Through cooperation between room thermostat and bonnet control it coordinates the action of the circulating blower and draft dampers to perfectly meet every condition.

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A handy switch on the Tripltrol provides full automatic control of the circulating blower from the room thermostat in the summer. The use of low voltage controls throughout simplifies the installation and eliminates all 110 volt wiring from the furnace or boiler.

White Manufacturing Co.

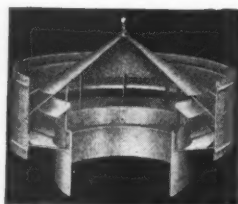
2362 University Ave.

St. Paul, Minn.

For full information write for Bulletin 900.

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For Successful Bidding on Public Works

You can rely on the complete Burt line to provide everything you need to meet any and every specification. Burt Ventilators are of the most advanced design, correctly made of first grade materials and priced to give biggest values. Burt makes a type and a size for every purpose. Outline your specifications and quantities and we will quote prices that will interest you.

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WHITNEY LEVER PUNCHES

No. 4B PUNCH



Length—8½ inches. Capacity ¼-inch through 16 gauge. Deep Throat—2 inches. Weight—3 pounds. Punches and Dies—¾" to ¾" by 64ths.

No. 6 PUNCH



Length—26½ inches. Capacity — ¼-inch hole through ¾-inch iron; especially adapted for button punching or temp-lat work. Punches and dies ¾" to ¾" by 32nds.

No. 91 PUNCH



Capacity — ¼-inch hole through ¼-inch, 1-inch hole through ¾-inch and 2-inch hole through ¾-inch iron. Depth throat 5 inches. Weight—82 lbs.

We have tools for every purpose needed by Sheet Metal Contractors.

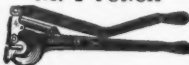
Ask your Jobber

No. 1 PUNCH



Length — 34 inches. Capacity — ¼-inch hole through ¾-inch iron. Punches and dies in sizes from ¼ to ¾ by 64ths.

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Length — 28 inches. Capacity — ¾-inch hole through ¾-inch iron. Punches and dies in sizes ¾-inch to ¾-inch by 64ths.

CHANNEL IRON PUNCH



Companion to No. 2 Punch. Every part of the two Punches interchangeable, including punches and dies. Capacity—¼-inch hole through ¾-inch iron.

W.A. WHITNEY MFG. CO.
636 RACE ST. ROCKFORD, ILL.

New Literature

For your convenience in obtaining copies of new Literature, use the coupon on page 92.

109—Engineering and Installation

The Dail Steel Products, Lansing, Mich., has just published a new folder emphasizing the importance of careful engineering and installation in the adaptation of winter air conditioning in public buildings, schools, churches and fine homes. Illustrations are shown of homes and buildings ranging in cost from \$25,000 to \$300,000, in which direct-fired warm air heat is being used, because the architects were sold on this system of heating due to the fact that proper engineering could assure results never attained in this field until recent years.

The Dail Company use the Technical Code of the National Warm Air Heating and Air Conditioning Association entirely in their engineering.

110—Winter Air Conditioning, a New Book

Winter Air Conditioning: Forced Warm Air Heating, by S. Konzo, Special Research Assistant Professor, University of Illinois. Published by the National Warm Air Heating & Air Conditioning Association. Cloth bound, 532 pages, 6x9 in. Price \$3.00. (Copies are available through this publication.)

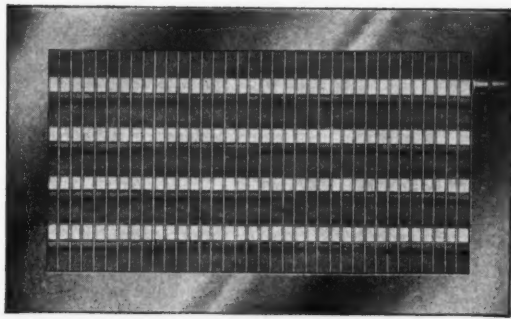
In this book there is made available to the industry an outstanding addition to the instructive literature available on forced warm air heating and winter air conditioning. The author has been identified with the warm air heating research work carried on at the University of Illinois under a cooperative agreement with the National Warm Air Heating and Air Conditioning Association. He has lived in the Research Residence, in which the research work has been conducted, and has therefore had a most exceptional opportunity to observe the performance of a forced warm air heating installation in actual operation, with different arrangements of the air supply and distributing system.

In this book Professor Konzo has compiled and arranged in logical sequence an imposing array of data and useful information on the subject based not only on the test data, but also on that collected from other sources. It accordingly comprises a manual on the design, construction, installation and operation of a modern residential winter air conditioning system.

The text is broad in its scope. The earlier chapters deal with the fundamentals, as it were, including such subjects as wet and dry bulb temperatures and relative humidity, humidification requirements and limitations, and the other factors that make for comfort. Succeeding chapters then take up the engineering phases of the subject, including heat loss calculations, and the several factors affecting heat loss. Next the author exhibits his grasp of the practical factors in dealing with dampers in duct systems, location of registers and other points on which the practical man must be well versed if he would make satisfactory installations. His treatment of the subject of registers and previously that of humidity should be appreciated for the understanding manner in which the explanations are made. There are several chapters containing data which should set at rest for all time controversies on such subjects as the position of registers, pressure and temperature losses and similar subjects.

Chapter 26 is entitled "Rational Approach to Design of Duct Systems" and is followed by three chapters entitled "Individual Duct Systems," "Trunk Duct Systems," and "Special Modified Forms of Duct Design."

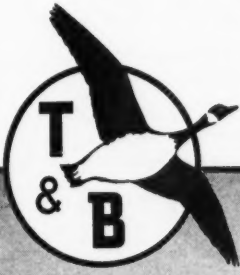
After one has carefully examined the book chapter by chapter, the logical conclusion is that it comprises a highly informative text that should prove useful to the engineer, the furnace dealer, the furnace salesman, the student, or, in fact, to anyone identified with any phase of the industry. On the whole, the author has done an excellent job and his work is recommended without reservation to all those seeking a more accurate knowledge of the subject.



2 INCHES ONLY--
ENTIRE REGISTER DEPTH
WHEN OPEN!

Tuttle & Bailey MULTI-SHUTTER REGISTER

Here is a multi-shutter register which you can use in **any** location regardless of the depth of the duct, for the full register depth is only 2" when open. Greatly increased demand for this type of construction has made it possible to materially reduce manufacturing costs, so that you can now have all the advantages of a multi-shutter register at very little over the cost of a single valve.



Catalog No. 39R just off the press lists the new **low** prices. Send for your copy today.

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HERE'S SOMETHING Worth Blowing About

Tell your customers and prospects how Cook Warm Air Switches for Fan, Blower and Limit Control will give them better performance of their heating plants and more satisfactory and comfortable heat.

It's a story worth telling. A story your customers want to hear. *A money-making story that will earn extra profits for you.*

Cook switches are built to give long-life, dependable, trouble-free service. Important improvements in design and construction provide easier installation, more convenient operation, more efficient performance.

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*New Simplicity of Installation
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Best Looking Ventilator in America

Good-looking, silent, durable—and just as efficient as they are good looking. That's the kind of ventilator your customers want, —maximum ventilation at minimum cost. Install ALLENS and make yourself *solid with your trade.*

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The Allen Corporation ALLEN TURBINE VENTILATORS

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Cash in on Cold Weather with



It's easy to interest prospects in forced filtered air during the cold weather. Call on them on a cold morning . . . ask if the children have colds . . . if some rooms are hard to heat.

Then show them how a REX AIR-PAK will provide comfort in every room . . . better health and a cleaner home.

Write for catalog and prices.

AIR CONTROLS, INC.
Division of
THE CLEVELAND HEATER COMPANY
1935 West 114th Cleveland, Ohio

New Literature

For your convenience in obtaining copies of new Literature, use the coupon on this page.

111—Revised Furnace Installation Codes

The National Warm Air Heating and Air Conditioning Association announces revision and publication of their three installation codes as follows:

Standard Gravity Code 25c single copies
Practical Mechanical Code 25c single copies
Technical Mechanical Code 50c single copies

The size of each code is 8½x11 in. A discount is quoted for quantities.

112—1939 Black & Decker Catalog

The Black & Decker Mfg. Co., Towson, Md., now has ready for distribution, the 1939 Catalog featuring a complete line of portable electric tools and accessories.

This new catalog comprises 56 pages and cover, displaying the Black & Decker line. Many new improvements in design and construction have been incorporated into many of the familiar units in the line and a number of new tools have been added to conform with the Company's policy to keep abreast of market requirements.

Three new units make their appearance in this catalog—the new ⅜ in. Hornet drill; the new ⅝ in. ball bearing utility Drill and a No. 36 portable electric hammer.

113—Roofing-Estimating Applying and Repairing

James McCawley, 175 Fifth Avenue, New York City, secretary of the United Roofing Contractors Association, is the author of "Roofing—Estimating, Applying, Repairing," containing 380 pages 5¼x8¾ with 150 illustrations. Price \$3.00 postpaid.

There is an historical sketch in chapter 1, covering primitive roof coverings, the story of tile, slate, asphalt and coal tar pitch, asbestos, and the relation of rags to roofing. Chapter 2 covers built-up roofing; chapter 3, steep roofing; chapter 4, metal roofing; chapter 5, flashings; chapter 6, repairing, re-roofing and re-siding; chapter 7, the expense of doing business; chapter 8, estimating; chapter 9, lightning rod application, nails and fastening devices, scaffolding and accident prevention.

The book tells how to estimate and apply built-up and metal roofing, how to construct rounded, canoe, open, mitered and other types of valleys; how to build the most economical and safe scaffolds; how to estimate the area of cut-up roofs from the ground; and how to conduct a profitable business.

FOR YOUR CONVENIENCE

American Artisan, 6 N. Michigan Ave.,
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Please ask the manufacturer to send me more information about the equipment mentioned under the following reference numbers in "New Products" and "New Literature."

(Circle numbers in which you are interested):

1	2	3	4	5	6	7
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15	16	17				

101	102	103	104	105	106	107
108	109	110	111	112	113	

Name Title

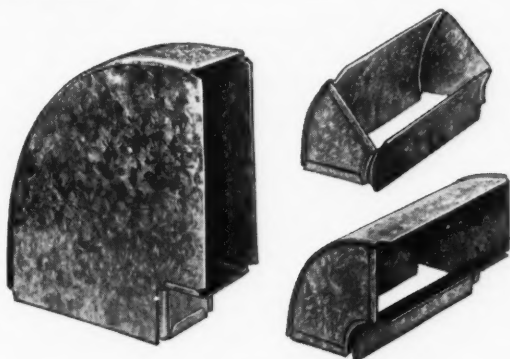
Company

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Are you Manufacturer—Jobber—Dealer—

AJAX

A new line of PREFABRICATED DUCTS and FITTINGS for forced air and air conditioning installations.



Our Catalog "A" Gravity Fittings, Catalog "B" Forced Air Fittings are yours on request.

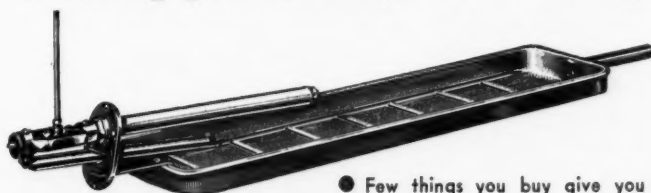
THE CINCINNATI SHEET METAL & ROOFING CO.

Furnace Fitting Department

230 E. Front St.

Cincinnati, Ohio

The Greater Value of the THERMO-DRIP HUMIDIFIER will help you to make more money



● Few things you buy give you the genuine value you get in the Thermo-Drip Humidifier. Armco Stainless Steel vapor pans . . . Monel metal valves and valve needles—measured by this standard alone, Thermo-Drip Humidifiers offer you more for the money. But check the other features of this modern air moistener—you'll find plenty to enthuse about. Heat-regulated water feed! Drip-governed evaporation! Elimination of mechanical parts, floats, instruments, etc.! And a price so low, homeowners will realize the folly of doing without it!

Thermo-Drip is certainly THE humidifier that will help you make more sales . . . easier sales . . . bigger profits. Let us send you full particulars.

AUTOMATIC HUMIDIFIER CO.

18th and Main Streets

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Since 1904

Pioneers in the manufacture of Oil Burners for every need of Home and Industry.

Let us help you solve your problem of heating and ventilating.

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Worthwhile territories and Johnson franchises available



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SELECTAIR

● Compact, dependable, this split system air-conditioning unit offers every desired feature for economical heating, air-conditioning and ventilating the home. With year-round domestic hot water. Oil-fired by the Johnson Pressure Type "Bankheat" Burner.

PERFORATED METALS

Every Sheet Metal Worker needs perforated metal in one form or another.

For processing food products and to withstand certain chemicals, perforated Stainless Steel and Monel Metal are much used.

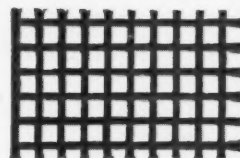
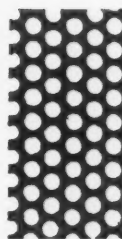
Factory Safety Guards—For this service perforated metal has no equal.

For Grilles, Radiator Enclosures, Air Conditioning Cabinets, we have many beautiful designs.

Write today for information and prices.

You'll like H&K prompt, satisfying work and pleasing prices.

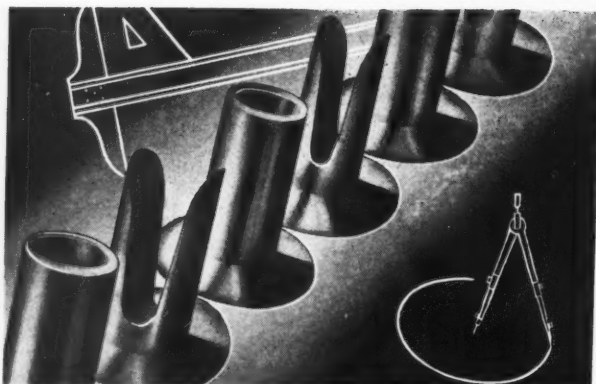
Perforators of metals since 1883. Send us your specifications.



The Harrington & King Co.

PERFORATING

5649 Fillmore St., Chicago, Ill. New York Office, 114 Liberty St.



BE SURE TO SPECIFY

The Best Rivets You Can Buy

One of many machines adapted for every riveting use.



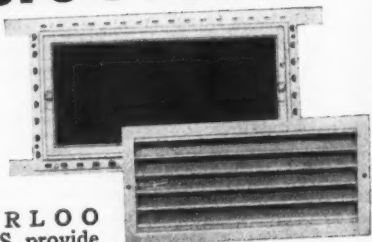
Inquiries invited, with samples of work you wish to do.

The word BEST is applied to T R & S rivets and automatic setting machines as recognition of adherence to the manufacture of a quality product as close to perfection as skill, inspection and processes of manufacture can produce—100% usable, accurately gauged rivets made by the world's oldest and largest Tubular and Split Rivet factory.

TUBULAR RIVET & STUD CO.

World's Foremost Producers of Rivets
WOLLASTON MASSACHUSETTS

More Features More Profits



WATERLOO REGISTERS provide extra features—extra value—to help boost your sales this year.

Waterloo exclusive "Venetian" type design—with matched registers for every requirement—multi-louvre control at the price of single valve control—supply registers with gaskets attached—and many other features. Get ALL the details. Write for Free catalog now.

FW-100 with Vee-U Frame. Adjustable one-piece register for walls.

WATERLOO REGISTER CO.
WATERLOO, IOWA SEATTLE, WASH.

WATERLOO REGISTERS

Stokers in Research Residence

(Continued from page 55)

the fan would also have been the same in the two cases. In general, the slightly smaller energy consumption of the fan in the hand-fired plant was accomplished by a slight sacrifice in the exactness of the control of the temperatures in the bonnet and in the second and third stories of the Residence. Hence, the reduction in energy consumption of the fan motor cannot be considered as an unqualified advantage.

Illinois Convention

(Continued from page 44)

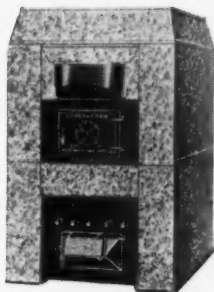
"Looking Ahead"

On more general subjects relating to the industry, Bennett Chappel, Middletown, Ohio, speaking on "Looking Ahead in the Sheet Metal Business," declared that he had (and everyone else in the business should have) a particular sympathy for the younger man now coming up in the industry. That he very frequently felt that the younger man should not be condemned for feeling that the sheet metal industry does not possess too many possibilities. He took his listeners back to the early days of the sheet metal industry to the old fashioned tin shop, and said that future progress might be analagous to the village blacksmith who passed out of the picture in favor of the automobile mechanic because he could not accept progress. Mr. Chappel said he felt the sheet metal contracting business is on the threshold of tremendous development; two things offering future opportunities. One is the growth of air conditioning and the other is the wider use of sheet metal in house construction. It should not be surprising, declared Mr. Chappel, to see the air conditioning industry within the next few years arrange itself alongside the automobile industry in volume and in competition for the public dollar. As to the growing use of sheet metal in house construction, Mr. Chappel cited the low-cost houses now being erected in many parts of the country employing interior and exterior walls of sheet metal. This business lies in the lap of the sheet metal contractor. That the sheet metal contractor will never want for lack of material is indicated by the tremendous number of continuous rolling mills now operated by the large sheet producers, 22 mills having been placed in production since 1936 and providing in one year 12,000,000 tons sheets.

Value of an Association

D. C. Ellison, Chicago, speaking on the need for increased association activities, declared that man

QUALITY EQUIPMENT--FROM HESS-- COSTS LESS



BENEFACTOR FURNACE

Gives far superior value in a high quality welded steel furnace, at a low price. It's rectangular throughout, has 2 1/2" thick brick fire box lining. Highly efficient with any fuel or automatic burner.

THE HESS LINE IS COMPLETE FOR EVERY DEALER REQUIREMENT

It includes, Hess Welded Steel Furnaces up to one million B.T.U. capacity Blower Filter Units, oil burners, coal stokers. Exclusive territory protection, free plan service, F.H.A. terms, free consumer literature assure increased dealer sales and profit.

WRITE FOR DEALER PORTFOLIO
HESS WARMING & VENTILATING CO.
1211-27 S. WESTERN AVE. Founded 1873
CHICAGO, ILLINOIS



PREMIER FURNACE CLEANERS COMPLETELY EQUIPPED

HALF HORSE POWER MODELS
60⁰⁰ and **64⁵⁰**
ONE HORSE POWER MODELS
84⁵⁰ and **89⁵⁰**

Premier Furnace Cleaners are powerful and light weight, yet sturdily built to stand years of rugged service. Weighing less than 50 pounds, they are one-man cleaners and have been the furnace man's favorite for years. Premier Cleaners are ideal for upstairs use and may be used independently from the container for suction and blowing use in cleaning air ducts, registers, grills, radiators and air conditioning equipment.

Motor specifications for these powerful cleaners are:

1/2 H.P. maximum vacuum 31 inches in water.

1 H.P. maximum vacuum 46 inches in water.

Business-Getting, Return Post Cards are Available for Dealers at Low Cost

Buy It From Your Local Jobber or Write the Manufacturer

Furnace Cleaning Instruction Booklet Free with Each Cleaner

ELECTRIC VACUUM CLEANER CO., INC.
1734 Ivanhoe Road Cleveland, Ohio

BENDING
BRAKES

WHITNEY-JENSEN

METAL
TOOLS

PART OF THE "SHOW"

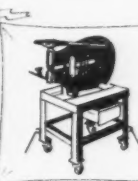
See our advertisement in the January, 1939, issue of AMERICAN ARTISAN for a more comprehensive display of Whitney-Jensen metal working tools, only a part of which are shown here.



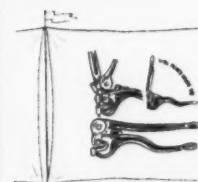
ANGLE IRON
SHEAR, NOTCHER
and BENDER



FOOT PRESSES
FOUR HANDY
SIZES



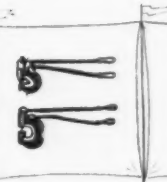
DEEP THROAT
PUNCH



ROLLER
BEARING
PUNCHES



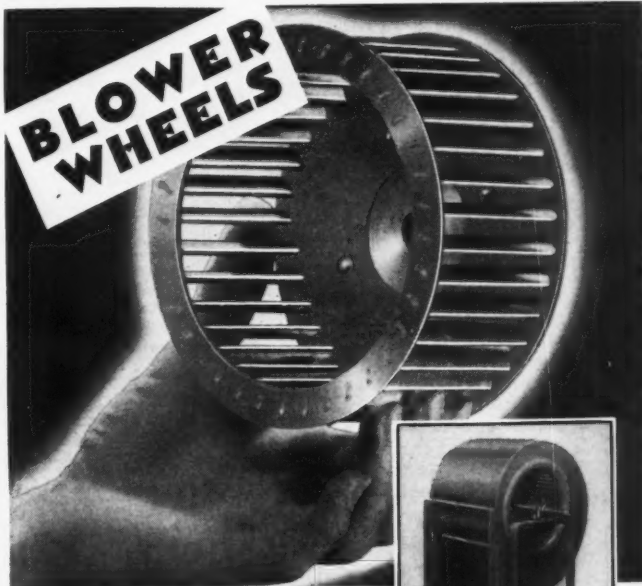
No. 5 Jr.
HAND
PUNCH



BALL
BEARING
PUNCHES

Write for our new 92-page Catalog No. 12, now available, giving complete details on the great Whitney-Jensen line.

WHITNEY METAL TOOL CO. • 97 Forbes Street, Rockford, Illinois



"HAVE CLARAGE MAKE THEM"

Every year we ship to furnace manufacturers and to builders of unit air conditioners thousands upon thousands of Clarage Blower Wheels and Assemblies. These smaller units were designed with the same skill characteristic of the larger Clarage equipment — just as carefully constructed — just as carefully tested. And we have sizes to meet ALL REQUIREMENTS — with slow speed operation insuring SILENT PERFORMANCE. May we have your next inquiry?



CLARAGE FAN COMPANY • Kalamazoo, Mich.
SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

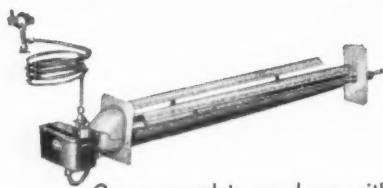


COMPLETE
ASSEMBLIES

SPECIFY CLARAGE

for
COMPLETE
AIR CONDITIONING
VENTILATION
HEATING
COOLING
MECHANICAL DRAFT
FANS & BLOWERS FOR
INDUSTRIAL NEEDS

These New Products Bring You NEW PROFITS



**No. 58-Z
Automatic
Humidifier**

Comes complete as shown with Patented Air Deflectors. Humidifier is built of bronze in 26" and 36" lengths. Water supplied through a No. 59-F Water-Boy feeder with thumb screw to adjust water line. It is fitted with enameled hood and overflow plates to fit a sloped or straight plenum of the furnace.

**No. 59-F
Water Boy Safety
Feeder**



This combination consists of a Midget float-controlled Water Feeder, 6 ft. of 1/4" O. D. Copper supply pipe, No. 8 Saddle Valve, 2 ft. of 5/16" Copper Tubing, and Fittings to connect feeder to humidifier. Water Feeder is housed in an enameled reservoir, 6" x 2 1/2" x 2 1/2", with cover and thumb screw for adjusting height of the water line.

Send for Free Catalog A-2.

MAID-O'-MIST, Inc.

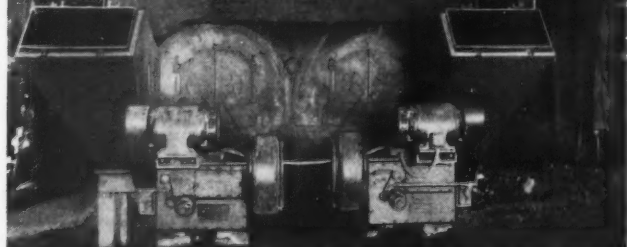
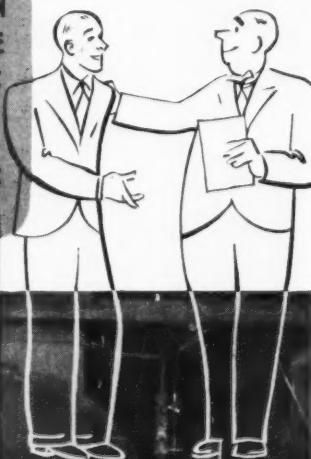
180 N. Wacker Drive,

Chicago, Ill.

**STOKER DEALERS: YOU CAN
FIRE SCOTCH MARINE TYPE
BOILERS AND FURNACES
SUCCESSFULLY WITH**

KOL-MASTER* STOKERS

• Kol-Master is installed right in the fire tube. Maintains proper combustion conditions; secures uniformly even coal distribution full length of fire box! Get details. We will gladly cooperate with stoker dealers who are not directly in competition with Kol-Master dealers.



***LARGEST, MOST COMPLETE LINE OF SINGLE RETORT,
UNDERFEED, SCREWFEED STOKERS in the WORLD**

**Write for Catalog 300 and Bulletin 503
KOL-MASTER CORP., OREGON, ILLINOIS**

was made to co-operate and that as far back as written history goes there have been sheet metal craftsmen and sheet metal crafts. One thing badly needed by some associations is active and energetic officers, because an association is only a reflection of the ability and enthusiasm of its officers. Associations are needed at this time because one man, speaking alone, can accomplish nothing, but an association of men, speaking as a body, can always attract attention and secure the things for which they are working. A good association, said Mr. Ellison, should have within its membership every contractor within its area, whether that man operates a union or non-union shop, whether he be large or small, whether he be an ethical contractor or a chiseller.

Laws, declared Mr. Ellison, are all right in their way, but they have limitations. Conduct, according to ethics of a business, must come from within a man. Too many associations attempt to keep so-called chisellers out of the organization, this is not a good move because such men can be made ethical only by education and such education can come only from association work.

Louis E. Drehobl, Chicago, reporting on the activities of the small business men's organization now headquartering in Washington and formed last year, said that the major accomplishment of the meeting in Washington was the laws recently passed enabling the small business man to make business loans based upon character or bills receivable, for sums as low as \$100 without collateral as demanded by commercial banks. No. 2 accomplishment is the stimulation given to house construction, particularly low-cost housing which, during 1938, accounted for a large percentage of total construction. Mr. Drehobl declared that the Small Business Men of America, a national association, undoubtedly will have an active voice in all future legislation and may some day be powerful enough to kill objectionable legislation. Mr. Drehobl expressed the opinion that while we have many local associations and state associations, what the industry needs is one national organization and national voice.

In conjunction with the meeting of the contractors, the Illinois Travelers' Auxiliary held two lively sessions during the convention. The Auxiliary shows more than 100 per cent increase in membership and from auxiliary fees and dues was able to sponsor a very fine entertainment and banquet for the contractors. 1938 Auxiliary officers having done such a very fine job were unanimously re-elected for 1939.

Automatic Heat Opens in Mattoon

Automatic Heat Co. has been established at 109 S. 19th St., Mattoon, Ill., by the H. W. Clark Co., which until last month was without a downtown outlet. The new store is in charge of Horace P. Clark, who will be assisted by B. H. Haddath. Among the company's line of heating equipment are Iron Fireman automatic coal burners, Hart oil burners, Waterman-Waterbury stoker fired steel furnaces and National Radiator Company's stoker fired boilers.



The DUR-A-BLE WARM AIR FURNACE

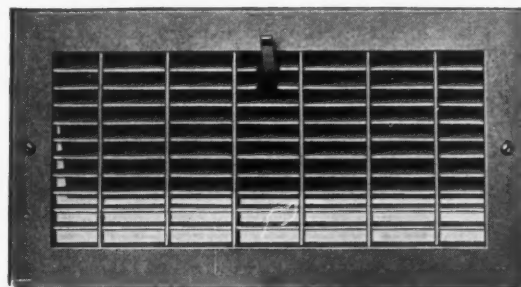
Another unit of the Grand Prize Line! An all cast furnace that you will be proud to install.

Furnished with round casing or enameled "easy to erect" rectangular cabinet.

New literature on the complete line is now available. Ask for it!

ST. LOUIS FURNACE MFG. CO.
2901-11 Elliot Avenue St. Louis, Missouri

REGISTERS and GRILLES



No. 3310 REGISTER WITH INDIVIDUAL ADJUSTMENT OF GRILLE BARS—45° UPWARD OR DOWNWARD.

Standard Stamping presents to the heating and air conditioning trade a striking new line of registers and grilles for gravity warm-air heating, air conditioning and ventilating systems. Modern in appearance and far better than average in performance, they offer the contractor an unusual opportunity to add the final touch to a good job, and at the same time, save money.

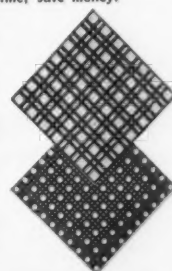
A complete catalog containing time saving charts and tables as well as the full line of "Standard Air-Control" registers and grilles is now available and will be sent on request. Write for your copy today!

PERFORATED METALS

Screens and grilles for many industrial purposes such as sorting, sifting, and light fancy panels. We have a complete line for almost any use.

WRITE for CATALOG!

STANDARD STAMPING & PERFORATING COMPANY
3131 W. 49th Place Chicago, Illinois



IN NEW YORK



"A
GREAT
HOTEL"

LARGE ROOMS, NEWLY
FURNISHED & DECORATED
SINGLE ROOM from \$3.00
DOUBLE ROOM from \$4.50
TWO POPULAR PRICED
RESTAURANTS

1 BLOCK FROM PENN. STATION
B. & O. Motor Coaches stop at our door.

HOTEL McALPIN

BROADWAY AT 34th ST., NEW YORK
Under KNOTT Mgt. John J. Woellle, Mgr.

METALBESTOS GAS VENT & FLUE PIPE

FULLY COVERED BY PATENTS

APPROVED BY UNDERWRITERS' LABORATORIES, INC.,
PACIFIC COAST BUILDING OFFICIALS CONFERENCE AND
OTHER AUTHORITIES

Why connect efficient gas fired appliances to inefficient vents or flues? METALBESTOS "THE ULTIMATE PIPE" offers that needed efficiency plus safety, durability and low cost of installation.

Condensation, occurring in other types of Vent Pipe, is absent in METALBESTOS.

WILLIAMS-WALLACE CO.
160 Hooper Street
San Francisco, Calif.

We are interested in your METALBESTOS GAS VENT and FLUE PIPE. Send along your catalog and price list!

NAME
STREET ADDRESS
CITY and STATE.....

Save Time on Forced Air Jobs With the Aid of This New Designing Manual



SECOND EDITION

FORCED AIR HEATING

215 Pages—6"x9"—clothbound—
Illustrated—\$2.00

109 Illustrations
15 Charts
23 Formulas
19 Tables

Into this enlarged second edition has been put, in simple, readily understandable form, ALL the information the contractor needs to enable him to design any forced air heating system correctly and efficiently. It embodies all of the really worthwhile data on forced air heating that has been made

available during the past several years, and shows by clear examples how to apply this knowledge properly in actual design work.

In designing a complete winter air conditioning system for a typical residence step by step, this practical manual outlines a model procedure of design, based on wide experience, which the contractor may follow with confidence on any of his own jobs. It also gives him a new data sheet, the use of which makes it impossible to overlook any factor in figuring the heat load, and shows in complete detail how to fill it in.

Every thought and device to make the new **FORCED AIR HEATING** a practical, everyday guide to correct procedure in forced air design work has been included in it.

Every contractor who is anxious to avoid mistakes and wasted time in forced air work should own a copy of this book. Send \$2.00 today to the address below for your copy. You may order with the privilege of returning the book within ten days for a refund, if for any reason it should prove unsatisfactory.

CHAPTER HEADINGS

A Suggested Data Sheet, Procedure of Design, Sizing the Apparatus, Infiltration, Registers and Returns, Multiple Registers, Return Air Systems, Selecting Register Temperatures, Temperature Drop in Ducts, Mechanical Code for Forced Air Heating, Sizing Ducts by Friction Chart Method, Sizing Extra Long Runs, Pressure

Losses, Velocities, Proportioning Losses in Heating Systems, Branch Take Offs, Volume Dampers, Bonnets, and Plenums, Casing Baffling, Chimneys and Drafts, Air Conditioning Radiator Heated Houses, Automatic Control, Contract and Specifications, The Index.

**KEENEY PUBLISHING
COMPANY**

6 North Michigan Ave., Chicago, Illinois

Where Are We Heading?

(Continued from page 45)

in warm air heating, fitted out with a sales kit full of beautiful pictures, pictures of heating equipment "modernized," pictures of basements beautified to the nth degree, pictures of small children playing on the floor, and so forth. Of course many sales were made as the advertising campaigns had been effective. But not the carloads the salesmen assured and dealers expected would be forthcoming.

Results of Poor Design

Then the trouble started. Installation costs were far in excess of what the dealer had been advised it would be. In nearly every case the dealer donated to the home owner rather than reap a profit. Winter brought greater trouble. "Where is the rare day in June?" "Since when is a South Sea breeze as cold as an Arctic gale?" "Where are the even temperatures promised?" "I want more heat here and less there," became common complaints.

What was the reason for this situation. I believe engineering (poor engineering). It was a lack of engineering along proper lines, lack of properly trained men and lack of men with years of practical experience in the heating field.

While all this was going on, far sighted manufacturers were endeavoring to establish forced air heating and residential air conditioning by slower, less spectacular, but more substantial methods. Such methods as renewed vigor of the National Warm Air Heating and Air Conditioning Association, larger and better meetings and closer working policies, new experiments conducted in the research laboratory at the University of Illinois. Co-operation was solicited from other universities and closer working agreements were made with the A.S.H.&V.E.

As further evidence of effort to place forced air heating on a sound basis, the Installation Codes Committee of the National Warm Air Heating and Air Conditioning Association labored untiringly to complete the New Technical Code for the Design and Installation of Forced Warm Air Heating Systems. Over six thousand dealers are using this code in full or in part, which readily shows the need for proper engineering instructions and methods.

Back to Engineering

A primary necessity today is to get back on a sound engineering basis. No equipment will perform without a proper installation. Everyone has said, "the best heater in the world will not work unless it is properly installed." This rule holds and always will hold. To live up to the reputation we enjoy will require taking advantage of every bit of engineering information available. We must properly educate the public to expect logical and reasonable results. Too much misleading information has been published and we must right this before it is too late.

THE PUBLIC DEMANDS QUALITY!
Chalmers has it



17 YEARS of active experience! Used widely in America, Europe, Asia and Africa. Carries Underwriters and New York City approval. Used by the U. S. Government. Adapted to Boiler-Burner and Furnace Units. New literature available for interested dealers — Write today. Use your letterhead, it stimulates us!

CHALMERS OIL BURNER CO. 1251 Central Avenue
MINNEAPOLIS, MINN.

ONE QUALITY ONLY

There is no "second grade" . . . no inferior quality of Lyonore Metal. Made according to a proven scientific formula owned by us, only one grade is manufactured. Be assured of years of satisfaction by specifying and using genuine Lyonore Metal for all sheet metal work. Ask for complete details.

LYON, CONKLIN & CO., Inc.
Baltimore, Maryland

Lyonore Metal

CHROMIUM — NICKEL — COPPER — IRON ALLOY

"BB" QUALITY

Order from your jobber



Saves time and labor

"BB" SPRING CIRCLE CLIP
Furnished only with "BB" Circles at no extra charge over old style straps.

BERGER BROTHERS CO.
229-237 Arch Street, Philadelphia, Pa.

PORTABLE SHEARS
ALL-ALLOY



Two Sizes

ALL-ALLOY No. 2 cuts up to 1/4" steel plate.
ALL-ALLOY No. 1 cuts up to No. 11 gauge strip or sheet
Special blades may be had for shearing stainless steel.


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BREMIL MFG. CO. Erie, Pa.

ACME "Hot Spot" WELDERS

Universally accepted as the sturdiest, easiest handled, most economical electric Spot Welder on the market.

Write for literature and prices
**Don't Rivet
SPOTWELD!
with an ACME**
Lifetime Guarantee!

Complete range of sizes
ACME ELECTRIC WELDER CO.
Distributors in principal cities
5619 Pacific Blvd. Huntington Park, Calif.
(Los Angeles County)



Repair Parts
GUARANTEED TO FIT

BRAUER
REPAIR PARTS
STOVE FURNACE BOILER OIL STOVE RANGE

IMMEDIATE SHIPMENTS
AND AT PRICES
THAT ARE RIGHT

A. G. BRAUER SUPPLY CO.
316 North Third St. • St. Louis, Mo.

THE GOESE TIME SAVER DAMPER CONTROL

Positive—Simplified
Less Labor to Install
Insures Tight Vibration-less Job
Can be Used on either Flat, Square or Round Pipes
Regular or Splitter Dampers
Screw Slot on Threaded Stud Shows Position of Damper.
Bearings—Rust Proof Metal. Wing Nuts—Cadmium finished.
Ask your jobber.



Patented

Goese Mfg. Co.
2548 N. 18th Street
Milwaukee, Wis.

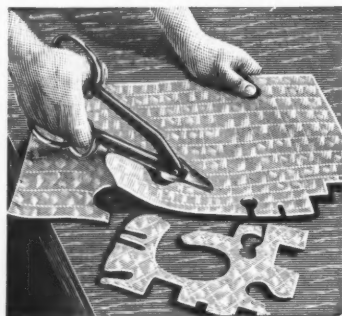
How to Sell Furnaces and Repairs
WITH
The TORNADO Furnace Cleaner



The TORNADO gets you into the basement where it is easy to sell repairs and new furnaces. And you make a profit on the cleaning job too!

Dealers say that the TORNADO is the most powerful furnace cleaner built. Leads the field! Low price—easy payments—free trial. Approved by Anthracite Institute and Underwriters Lab. Thousands in use.

Write now for complete information.
Breuer Electric Mfg. Co.
5082 Ravenswood Avenue, Chicago, Ill.



WISS SCROLL-PIVOTER SNIP

Cuts circles, scrolls
and squares as eas-
ily as a straight line.
Will cut alloy metals.

Now furnished with
serrated blade unless
otherwise ordered.

Use Wiss Hy-power and Bulldog Snips

J. WISS & SONS CO.

Established 1848

Newark, N. J.

ATTRACTIVE PROPOSITION— ON THE NEW PEERLESS LINE



The new Peerless line of coal, coke, oil and gas furnaces for manual or automatic firing, offer dealers an exceptional sales and profits opportunity. These new furnaces have "everything." Beauty, unusual efficiency, low operating costs. Many improved features including self-contained blower and filters. More perfect combustion. Model shown in illustration burns coal or coke. Ask for literature, prices and discounts to the trade. Write today.

PEERLESS FOUNDRY COMPANY

1853 LUDLOW AVENUE

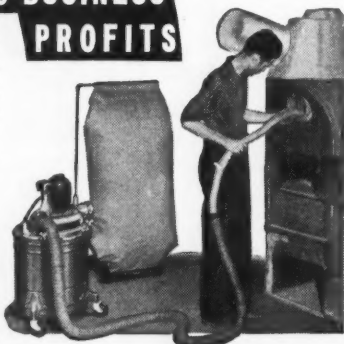
INDIANAPOLIS, IND.

THE OPEN DOOR to BUSINESS PROFITS

Greater fuel economy and better heating are the results of the Doyle Plan for increasing furnace cleaning demand among your regular customers. It is an open door to more business because it builds up customer confidence and makes them rely on your recommendations. You make a profit on every cleaning job.

*Send for Our Plan
to Increase Sales*

It shows you how to solicit and handle every job so you are sure of making a constant and satisfactory profit. This plan is TESTED. It works. Write today.



DOYLE VACUUM CLEANER CO.
227 STEVENS ST., S. W. GRAND RAPIDS, MICH.

*Easy and Convenient
to order from Des Moines all*

STOVE, FURNACE and BOILER REPAIR PARTS

*Accurate patterns — Quality castings
speedy, correct and complete service.*

MODERNAIRE FURNACES

Fittings, Registers, Blowers, Supplies

DES MOINES STOVE REPAIR CO.
DES MOINES, IOWA

Salem Code

(Continued from page 48)

furnace, the area of the cold air intake shall be at least equal to the area of the warm air outlet of the grating. Article VI, section 4, relative to casing shall not govern this type of furnace installation, but the following specifications shall be followed.

The inner and outer casing of this type of furnace shall be made of black or galvanized iron not lighter than No. 26 gage. A uniform air space shall be maintained at all points between the inner and outer casings. In no case shall the top of the heater be allowed closer than 12 inches to any ceiling or joists above the furnace.

(b). Where joists are cut to accomodate this furnace, headers shall be put in and braced.

(c). Article III, for determining areas of warm air pipes shall not govern in figuring this type of furnace.

(d). Where one warm air register face is used and a separate face or faces for cold air supply are used, then Article VI shall apply.

ARTICLE VII

Section 1. Flue shall be built in accordance with specifications in the building code.

Section 2. The following provisions shall be made by the owner or building contractor in any new construction or addition wherein a warm air heating system is to be installed.

(a). The narrowest internal dimension of a furnace flue shall be not less than eight inches and no flue smaller than 8 by 12 inches rectangular shall be used, except that in making a furnace replacement no furnace flue smaller than 8 by 8 inches be used.

(b). The furnace foundations shall be provided by the owner or building contractor as outlined in Article VI, section 2 (a).

(c). Where warm air register boxes, heads, pipes, or stacks are to be installed, joists shall be set not less than 16 inches on center and shall be butted and tied with one-inch scabs at least 2½ feet long the full width of the joists, leaving a space of not less than 14 inches between studs and joists.

(d). All first story single and sub-floors shall be continuous. In all houses having studded exterior walls, these floors shall be extended to the outside sheathing and all spaces between studdings shall be closed at the attic line.

(e). All partition walls or sections of these walls in which heat stacks to second or third floor rooms are to be installed shall be of sufficient size to accomodate stacks required to heat said rooms.

ARTICLE VIII

Should any section or provision of this ordinance be held unconstitutional or invalid by any court, all other sections and provisions shall nevertheless be deemed as effective as though such unconstitutional or invalid section or provision had never been inserted in this ordinance.

ARTICLE IX

All ordinances or parts of ordinances inconsistent with the provisions of this ordinance are hereby repealed.

ARTICLE X

Any person, persons, firms, or corporation violating any provision of this ordinance shall be subject to a fine of not less than Five (\$5.00) dollars or more than Two hundred (\$200.00) dollars or imprisonment in the City Jail not less than two days or more than thirty (30) days or both such fine and imprisonment, in the discretion of the court.

Passed and adopted by the Common Council this day of, 1935.

ATTEST:

.....
City Recorder

Approved by the Mayor this day of, 1935.

.....
Mayor

PYROLITE HEAT RESISTING PRODUCTS

Nu-Dry Furnace Cement is a new type cement which makes a GASKET between the castings, will not crack, powder, or bloat when furnace is fired immediately after cement is applied.

Radolite Asbestos Furnace Cement is plastic type cement.

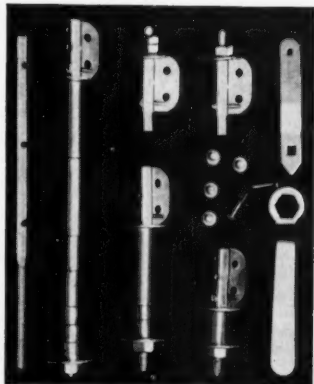
Pyrolite Ready Mixed Aluminum Paint stands high temperatures, gives bright silvery finish even after long standing in the package.

Pyrolite Heat Resisting Black Paint protects metal surfaces subjected to extreme heat.

Send for complete information.

THE PYROLITE PRODUCTS COMPANY
CLEVELAND, OHIO

The New K-B Damper Control



A foolproof, easily installed damper that will add efficiency to your installations.

Unique construction features separate rods and holders, allowing positive locking and close adjustment. Eliminates duct deforming.

Adjustable for any insulation or furring—always shows true position. ASK YOUR JOBBER—or write direct for particulars. Send 25c for working sample and direction sheet.

G. L. Kerentoff
2803 Jefferson Ave.,
Cincinnati, Ohio.

CHECK YOUR HEATING INSTALLATIONS

WITH THE

"ALNOR" VELOMETER



This all-purpose air velocity meter indicates air velocities directly and instantaneously on the scale in f.p.m. without the necessity of timing or mathematical calculations. Standard range 0-300, 0-3000 f.p.m. Other ranges available up to 18,000 f.p.m.

Write us today for a folder giving more complete information.

ILLINOIS TESTING LABORATORIES, INC.
412 N. LaSalle Street Chicago, Illinois

ST. LOUIS'
FINEST
HOTEL



AT THE CENTER OF THINGS

RATES FROM
.... \$3.00

CORONADO
HOTEL

SPRING AT LINDELL
SAINT LOUIS MISSOURI

Preston J. Bradshaw, Director

FOUR FAMOUS
RESTAURANTS

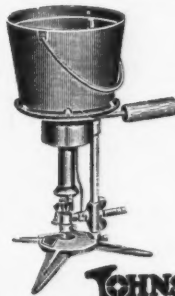
UNIFORM HIGH QUALITY ... at No Extra Cost

Ryerson certifies to the known uniform high quality of all steels in stock. Tighter, more accurate specifications—rigid inspection and checking—and years of preparation have built up stocks of these better steels. More than 25 kinds of sheets and all other steel products for the sheet metal worker are included. Special quality features and greater uniformity assure easy workability. When you need steel, order from the nearest Ryerson plant. Immediate Shipment is assured. Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Philadelphia, Cleveland, Buffalo, Boston, Jersey City.

RYERSON
Certified
STEELS

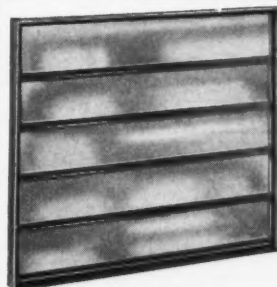


Johnson No. 8 Torch and Melting Pot Saves Time and Money in Every Shop



Here is the ideal torch for Plumbers, Metal Workers, and every Shop, School and Laboratory. Removable pot handles 22 lbs. lead, babbitt, or any low-fusion metal. Torch with shield serves efficiently for soldering, tempering or any pre-heating work. Johnson Patented Direct Jet Bunsen Burner is adjustable to any angle, or removable for use as a powerful hand torch. Requires no blower, yet equals "air-blast" performance. Ask for free catalog now.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA



Erwin Type

Get our prices on Automatic Shutters, Stationary Shutters, Hand-operated Shutters and Balanced Vent Units.

Elgo Ventilating
Specialties

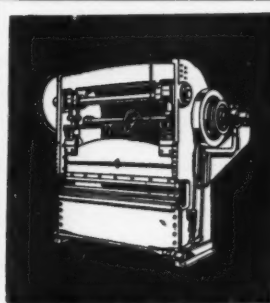
Automatic Back Draft Damper

Permits air to flow in one direction only. Opens automatically under pressure of air current when fan or blower is in operation—and closes when current is shut off, preventing annoyance of back pressure or drafts. Sizes from 10" to 60" square—also rectangular.

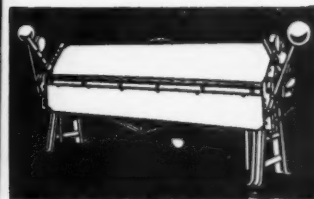
Write for catalog and prices.

ELGO SHUTTER & MANUFACTURING CO.
634 W. Warren Detroit, Mich.

Free
CATALOG



PRESS BRAKE






HAND BENDING BRAKE

Steel Brakes—Presses—Shears

DREIS & KRUMP MFG. CO.
7404 LOOMIS BLVD. CHICAGO

HARD GUYS TO SELL...

THESE PROSPECTS OF YOURS

YOUR SALESMEN MEET MANY BUYERS WHO WEAR DEFENSIVE MASKS. SOMETIMES THEY POSE AS TOUGH GUYS  OTHERS, ACTING LIKE SAD GUYS,  EVOKE SYMPATHY TO AVOID BUYING. EQUALLY HARD TO HANDLE ARE THE FUNNY GUYS  WHO PRETEND TO TAKE NOTHING SERIOUSLY THE WELL-KNOWN WISE GUYS,  THE "PUFFED-UP" POMPOUS GUYS  AND THE TOO, TOO NUMEROUS  EVASIVE GUYS.

DEVIOUS are their defensive ways, these hard-to-sell prospects of yours. But there is one thing these buyers have in common. They drop their defensive attitude when they pick up American Artisan to get progressive ideas and the news of the warm-air heating, air conditioning and sheet metal contracting field. And just

as they are receptive to the counsel of editors in whom they have confidence, they are receptive to profit-making ideas suggested through the advertising pages. Your advertising in American Artisan will reach your hard-to-sell prospects while they are "themselves." It will help your salesmen to get back of those masks of sales resistance.

Highest editorial standards and publishing integrity.



AMERICAN ARTISAN

← bears the two hall-marks of known value →



Proved reader interest in terms of paid circulation.

Classified

SITUATIONS OPEN

HEATING SALESMEN WANTED — We have openings for five thoroughly experienced heating salesmen. Do not apply unless your experience covers calculating heat losses, laying out forced air heating systems, servicing coal, oil and gas fired units. Address The Rudy Furnace Company, Dowagiac, Mich.

WANTED: first class mechanic for Southern Minnesota shop specializing in outside sheet metal work and roofing, capable of becoming foreman. Will guarantee at least \$2,000 yearly to start. Good opportunity for a live wire. Address Key No. 451, American Artisan, 6 N. Michigan Ave. Chicago, Ill.

SITUATIONS WANTED

Man 39, with twelve years' experience in Automatic Heating and Commercial Refrigeration desires position in Western States. My experience covers sales, both wholesale and retail, practical design of forced air heating systems and commercial refrigerating systems, and the installation and service of oil burners, gas burners, stokers and refrigerating machines. Best of references. Correspondence solicited. Address Post Office Box No. 1771, Reno, Nevada.

Twenty years' experience in sheet metal, plumbing, heating and air conditioning. Can figure, layout and sell. Will start at modest wages. Single. Go anywhere. Address Key No. 454, American Artisan, 6 N. Michigan Ave., Chicago, Ill.

The American Artisan Service Section presents a golden opportunity to contact a national circulation at comparatively small cost. Manufacturers can use it to make any article sell and dealers will find it an inexpensive way to contact a live buying trade. Don't delay—send in your copy now for the next issue. See bottom of page for rates.

AMERICAN ARTISAN Service Section

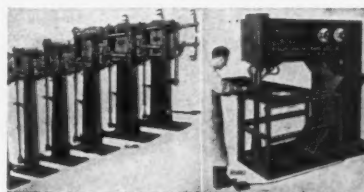


BEVERLY THROATLESS SHEARS

are indispensable to the modern, up to date sheet metal shop. Light, portable, yet extremely strong, they will make your shearing operations much faster, neater and more economical thru time saved on the job. They are made in two sizes to handle up to 14 or 16 gauge metal and are very reasonably priced.

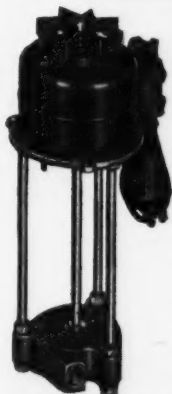
Write today for literature and prices.

BEVERLY SHEAR CO.
3009 W. 110TH PLACE, DEPT. 3, CHICAGO



Electric welding equipment of every description to weld from a watch case to a door. Also special welding machines, spot, butt, seam, a. c. arc welders in sizes from 1/4 to 500 KVA. Ask for our catalog No. 38-WT. Also production job welding.
EISLER ENGINEERING CO., Inc.
761 S. 13th St. NEWARK, N. J.

EQUIPMENT FOR COOLERS EVAPORATIVE TYPE



ESKIMO Recirculating PUMP . . .

This small vertical centrifugal pump is direct connected to motor equipped with cooling fan.

Capacity: 1 G.P.M. against 6 ft. head.

Pump and impeller of cast bronze. Motor shaft stainless steel.

Size: 9 1/2" high; diam. mounting ring 3 3/4". Weight 5 lbs.

Write for catalog and prices.

STAR RADIATOR CO.

Manufacturers

649 Ceres Ave.

Los Angeles, Calif.

ACE SPOT WELDERS

For economically assembling sheet metal parts and parts made of wire.

CHEAPER THAN RIVETING

AVERAGE COST OF CURRENT FOR 1,000 SPOT WELDS ONLY 3c

Built for production service. Engineered to meet the practical requirements of sheet metal shops. Available in sizes from 5 K. W. up.

Send today for Free Literature.

PIER EQUIPMENT MFG. CO.

Welding Equipment Division
729 Cross St., Benton Harbor, Michigan

AUTOVENT

"The Complete Line" of
FANS - BLOWERS - LOUVRES



31 Series PROPELLER FANS

Rugged, "quiet-quality" construction! Efficient, economical operation! CERTIFIED RATINGS. Will not churn air or overload motor!

Write for FREE Bulletins today!

AUTOVENT FAN & BLOWER CO.

1807-19 N. Kostner Ave., Chicago, Ill.



"DO-ALL" Combination Electric Hammer & Drill

drills both concrete and metal. Cap. 1 1/2" in concrete—3/4" in metal. Saves time and money in setting expansion bolts, anchors and plugs. Soon pays for itself. Easy to maintain. Bulletin 381. Wodaek Electric Tool Corporation, 4644 W. Huron St., Chicago, Ill.

BEST BY TEST!

TRY IT!!



NEW IDEAL SPOT WELDER

Floor Type
7 1/2 K.W. (10 KVA)
18" arms, 2 pieces
14 ga.\$150.00
10 K.W. (13 KVA)
24" arms, 2 pieces
1/2"\$185.00

SPECIAL

All-Steel Press Brakes, 3' to 8'.
10' 16 ga. Power Shear with Motor, \$600.00.
10' 14 ga. Chgo. Steel Hand Brake, \$325.

INTERSTATE Machinery Co., Inc.
107 S. Clinton St., Chicago (Free Parking)

Use AMERICAN ARTISAN Classified Advertising for quick results. It puts you in direct touch with the buyers and sellers in the warm air heating, sheet metal contracting and air conditioning industry.

SERVICE SECTION: Rates for display space similar to above in Service Section are \$5.00 per inch per insertion. One-inch minimum space accepted. **Classified Section:** Rates for classified advertising are 5 cents for each word including heading and address. Count seven words for keyed address. Minimum \$1.00 for each insertion. Cash must accompany order.

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The only 7 star fuel is

Pennsylvania **ANTHRACITE** (HARD COAL)



1. COMFORT

Gives steady, even heat for real winter comfort. No "off-and-on" heat. Glows within itself—heat always in reserve.



2. CONVENIENCE

Automatic heat in any equipment with thermostatic control. Automatic fuel and ash handling all season if desired.



3. SAFETY

Can not leak, spill or explode. Anthracite is the world's safest fuel. It burns silently and is safe to use and store.



4. CLEANLINESS

Can't smoke, create smut or smudge. Keeps homes clean inside and out. Saves laundry costs—and depreciation.



5. HEALTHFULNESS

Insures even temperature. Reduces illness due to up and down temperatures. No cold floors, no air pollution.



6. DEPENDABILITY

Supply for long periods can be stored in small space. Needless to be without heat when weather stops fuel delivery.



7. ECONOMY

Modern Anthracite provides all 7 essentials to complete heating satisfaction at the lowest possible cost for fuel.

WHEN you are consulted about the best fuel for winter heating, remember the exclusive advantages of Pennsylvania Anthracite. Here is one fuel that gives every user all of its 7 heating advantages in any type of heating equipment.

Anthracite does not demand the use of costly equipment. It permits the user to choose the right combination of convenience and economy that best suits his needs and budget. Moreover, it provides the opportunity to add convenience features at will.

Anthracite stokers, providing completely automatic fuel and ash handling, can be installed in an existing furnace or boiler as readily as in a new heating plant.

With any other fuel, the user must give up some of the advantages of Anthracite—which offers the features of all other fuels, and its own exclusive features besides. It is no wonder that Pennsylvania Anthracite is the preferred fuel in more than 6,000,000 homes. It is no wonder that heating contractors who know and actively

sell its advantages of modern Anthracite equipment, are building for a sound and successful business future. Write for a copy of the interesting new book describing the advantages of Anthracite and Anthracite equipment. Anthracite Industries, Inc., Chrysler Building, New York, N. Y.



This Seal of Approval appears on equipment only after a representative sample has satisfactorily passed rigid and impartial tests at the Anthracite Industries Inc. Laboratories.

Save with
ANTHRACITE
(HARD COAL)
THE ONLY 7 STAR FUEL



*Flash . . . you're
set for success
with . . .*

Your Newest
MILCOR
Money Maker

**KUEHN'S
HALF-ROUND
GUTTER**

Has the business-getting features of
KUEHN'S SQUARE GUTTER

Again Milcor gives you a profit-builder that puts you in a class by yourself in competing for good jobs—Kuehn's Half-Round Gutter.

Here are the same exclusive features that made Kuehn's Square Gutter a real sensation of the industry . . . *strength, beauty, ease of handling.* Yet Kuehn's Half-Round Gutter (4" and 5" sizes) costs no more than ordinary half-round . . . When your customer sees the better job you do with Kuehn's Half-Round, he's mighty proud of it, and so are you . . . It's an easy job and a quick one to hang this new gutter, for Milcor's precise methods of manufacture mean absolute uniformity, and true, snug fit of joints and accessories . . . Bring more gutter jobs your way — use this revolutionary new profit-builder, Kuehn's Half-Round Gutter. Write today for descriptive literature and free sample.

G-20

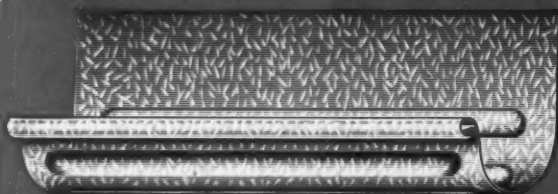


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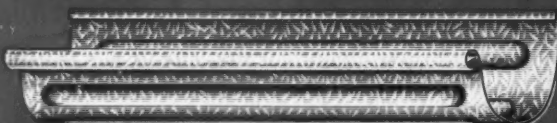
**Exclusive
features for
strength and beauty**

- | | |
|---|--|
| 1 Hemmed here for strength and easy handling. | 5 Precision Manufacture makes trough straight and true. |
| 2 Decorative Flute adds strength. | 6 Outer Bead has stiffening tongue. |
| 3 Perfect Formation of half round shape. | 7 Decorative and Reinforcing Flute on bottom. |
| 4 Fluting on Outer Side reinforces and beautifies. | |

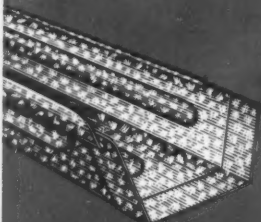
Complete Line of Accessories for
Kuehn's Half-Round Gutter



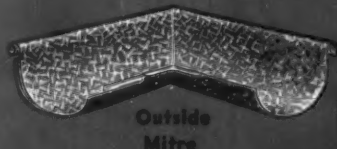
High-back Type



Lap-joint Type



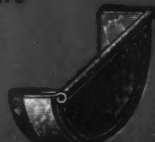
KUEHN'S SQUARE GUTTER
Beautiful Square Gutter
with same construction
feature as Kuehn's Half-Round



Outside
Mitre



B Drain



C End

Unit of
the complete
MILCOR
Rain-Carrying
Line

MILCOR STEEL COMPANY

MILWAUKEE, WISCONSIN

CANTON, OHIO

Chicago, Ill. Kansas City, Mo. La Crosse, Wis.